This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

LANE MEDICAL LIBRARY STANFORD
C79 1907
STOR
es of the male generative organs.
24503431970

DISEASES
THE MALE
RATIVE ORGANS

EDRED M. CORNER

LANE
MEDICAL LIBRARY

SEAL OF THE LELAND STANFORD JUNIOR UNIVERSITY
SEMPER VIRENS
1885

Library of

Dr. Rufus L. Rigdon

AMERICAN BANK NOTE CO LITHO

OXFORD MEDICAL PUBLICATIONS

DISEASES OF THE MALE GENERATIVE ORGANS

BY

EDRED M. CORNER
M.A., M.B., B.Sc., M.C., F.R.C.S.

SURGEON TO OUTPATIENTS, ST. THOMAS' HOSPITAL
SENIOR SURGEON TO OUTPATIENTS, CHILDREN'S HOSPITAL, GREAT ORMOND STREET
CONSULTING SURGEON TO THE WOOD GREEN AND PURLEY HOSPITALS
LATE ERASMUS WILSON LECTURER, ROYAL COLLEGE OF SURGEONS, ETC.

LONDON
HENRY FROWDE   HODDER & STOUGHTON
OXFORD UNIVERSITY PRESS   WARWICK SQUARE, E.C.
1907

LANE LIBRARY

C79
1907

PREFACE

Amongst the diseases of the Male Generative Organs are two, gonorrhoea and syphilis, which with their complications are each worthy to form the matter of a separate monograph. In consequence, their main features alone have been mentioned in relation with their influence on the generative functions. The affections of the prostate should form the subject of a separate volume in any series. The preparation of this book has been a matter of considerable difficulty, as not only have these three important divisions been removed, but amongst the manifold affections of the testicle, the spermatic cord, the tunica vaginalis, the vesiculae and the scrotum, it was not easy to select what to include and what to omit. With regard to the urethra and penis only such common affections have been mentioned as bear directly upon the generative function. Thus, an attempt has been made in this manual to present a practical survey of the diseases of the generative tract, uncomplicated by consideration of those of the urinary tract.

83876

The divorce of the diseases of these two tracts was thought to be a practical gain to the busy man.

A tendency has grown up to speak of the body as the testis, and of the body and epididymis as the testicle.

I am indebted to Dr. H. I. Pinches for many drawings for the purposes of illustration. Dr. Athole Ross has been kind enough to supply me with material for the note upon the cytological examination of hydrocele fluids.

EDRED M. CORNER.

37, HARLEY STREET, W.

CONTENTS

CHAPTER I PAGE

HYDROCELES AND HAEMATOCELES 1

CHAPTER II

THE PHYSIOLOGY OF THE TESTICLE . . . 43

CHAPTER III

THE WANDERING OR MOVABLE TESTICLE . . 51

CHAPTER IV

THE IMPERFECTLY DESCENDED TESTICLE . . 62

CHAPTER V

THE TESTICLE: ITS RELATION TO ITS BLOOD SUPPLY, ITS DUCT, AND INFLAMMATION: OPERATIONS . 80

CHAPTER VI

ATROPHY AND HYPERTROPHY OF THE TESTICLE . 98

CHAPTER VII PAGE

Torsion of the Testicle 106

CHAPTER VIII

Epididymitis, Orchitis and other Diseases of the Testicle 123

CHAPTER IX

The Functional Affections 161

CHAPTER X

Diseases of the Spermatic Cord 176

CHAPTER XI

Diseases of the Vesiculae Seminales . . . 213

CHAPTER XII

Some Diseases of the Urethra 220

CHAPTER XIII

Diseases of the Prepuce and Penis 231

CHAPTER XIV

Diseases of the Scrotum 260

ILLUSTRATIONS

PAGE

1. A Normal Testicle in the Tunica Vaginalis . 4
2. A Vaginal Hydrocele 7
3. The Method of Tapping 13
4. The Parts after a Radical Cure for Hydrocele . 16
5. A Congenital Hydrocele 18
6. An Infantile Hydrocele 20
7. An Inguinal Hydrocele 23
8. A Bilocular Hydrocele 25
9. Interstitial Sacs 26
10. A Hydrocele in a Hernial Sac 30
11. A Partial Enterocele 30
12. The Descent of the Testicle 44
13. A Movable Testicle 53
14. A Movable Testicle and Inguinal Lipoma . 55
15. A Movable Testicle and Acquired Hernia . 57
16. Masked Imperfect Descent of the Testicle . 77
17. Specimen from a Case of Subacute Torsion of the Cord . . . . . . *To face* 116
18. Haemorrhage in Torsion of the Testicle ,, 118
19. A Microscopic Section of Haemorrhagic Infarction of a Testicle caused by Torsion of the Cord. . . . . . *To face* 118

PAGE
20. The Relative Sizes of the Parts of the Testicle in Epididymitis and Orchitis 129
21. Diagram of the Structure of the Testicle to show how easily it can be Sterilized by Epididymitis 130
22. Advanced Tuberculosis of the Epididymis. The Testis is unaffected to the Naked Eye, affected under the Microscope . . . 147
23. Advanced Tuberculosis of the Epididymis and Vas with Microscopic Foci of Caseation in the Testis . . . . . *To face* 149
24. Carcinoma of Testicle . . . ,, 156
25. The Structures of the Spermatic Cord . . 177
26. Methods of Thickening of the Spermatic Cord . 179
27. Anomalous Descent of the Spermatic Cord . 182
28. Tubular Hydrocele of Cord 184
29. Encysted Hydrocele of Cord 186
30. Structures felt in Rectal Examination . . 214
31. Structures at Base of Bladder . . . 216
32. Incision in Skin for Circumcision . . . 233
33. Incision in Mucous Membrane for Circumcision 233
34. Preputial Canal 238
35. Paraphimosis 239
36. Incisions for Meatorrhaphy 242
37. Meatus after Meatorrhaphy 243
38. Lymphatic Glands in Groin 258
39. Scrotal Haematocele 263
40. Vaginal Haematocele 264
41. Scrotal and Vaginal Haematocele . . . 265

CHAPTER I

HYDROCELE OF THE TUNICA VAGINALIS

A HYDROCELE is an accumulation of clear fluid within the cavity of the tunica vaginalis. Sometimes they are called vaginal hydroceles. Broadly, they can be divided into two classes, the acute, and the subacute or chronic.

I. ACUTE HYDROCELES

Hydroceles are termed acute when the fluid is effused rapidly into the cavity of the tunica vaginalis. This arises in one of three ways: as the result of some contusion or punctured wound, of some inflammation of the testis or epididymis, or in the course of some general disease such as erysipelas, rheumatism or one of the continued fevers. In the last, the formation of the hydrocele is like the effusions into joints or the pleura, which are known to occur in these cases. It is the result of a blood infection, or possibly chemical irritation. Similarly, it is to be expected that the same organisms will be found to cause acute hydroceles which are known to produce acute synovitis, such as the micrococci of rheumatism or gonorrhoea, the bacillus coli communis, the pneumococcus, typhoid bacillus, etc. Such instances are far from common, and no opportunity should be lost of tapping a hydrocele, which occurs in the course of a general disease, and of having the fluid examined for the specific organism which is responsible for it. In practice, the acute hydrocele is almost always the result of some inflammation of the testicle. The symptoms are merged into those of the testicular trouble, whilst the hydrocele makes its presence felt during the examination by obscuring the outlines of the testis and epididymis; somewhat in the same way that a water bed obscures the shape of articles placed under it. The acute hydrocele is a mere symptom of the epididymo-orchitis. Therefore, the treatment must be directed towards the affection of the testicle. The hydrocele only requires treatment if it become very tense; then it should be tapped. The fluid withdrawn differs from that obtained from a chronic hydrocele, in being of an inflammatory character, rich in all elements, and more readily and spontaneously coagulable. At times an acute hydrocele may proceed to suppuration when it is called a pyocele (page 40).

It is a doubtful point if the fluid which is poured out into the sac of a strangulated hernia should be called **an acute hydrocele in a hernial sac.** There is such perfect unanimity about including the subacute or chronic hydroceles in hernial sacs amongst the affections of the spermatic cord, that I think attention should be directed to the more acute conditions found under similar conditions. Acute hydroceles in hernial sacs occur as the result of the obstruction to the return of the blood in the veins of the omentum or mesentery of the bowel included in the strangulation. At first, the fluid in the sac is the result of passive exudation ; later, it is due to inflammation of the walls of the sac and hernial contents ; later still, but very quickly, the simple character of the inflammation has been changed to a septic one by the migration of organisms from the strangulation viscera. The first organism to appear has been shown by Messrs. Dudgeon & Sargent to be the staphylococcus albus, whose rôle these authors have shown is rather protective than deleterious.[1] This is succeeded, in time ratio according to the severity of the strangulation, by the bacillus coli communis. The fluid of an acute hydrocele is often bloody, forming a haematocele in a hernial sac ; and, through necrotic inflammation of the hernial contents, it may become a pyocele.[2]

---

[1] *The Bacteriology of Peritonitis* (Constable & Co.).

[2] *Clinical and Pathological Observations in Acute Abdominal Disease* (Constable & Co.), by the Author.

II. SUBACUTE OR CHRONIC HYDROCELES

are usually divided into four classes : the ordinary hydrocele, the congenital hydrocele, the infantile hydrocele, and the inguinal hydrocele.

THE SUBACUTE OR CHRONIC HYDROCELE OF THE TUNICA VAGINALIS

The fluid in these cases is clearly allied to ordinary serum ; its specific gravity is 1020–1025, it contains albumen, and a small amount of fibrinogen, but rarely coagulates spontaneously. Generally it has a pale yellowish colour, occasionally presenting a glistening appearance due to the presence of cholesterin crystals. That the fluid is not a mere physical effusion into the tunica vaginalis is shown by the marked and relatively large amounts of alkaline carbonates and sodium chloride in it, conditions which can only be ascribed to a selective and secretive action on the part of that membrane itself. That hydroceles are accompanied by changes in the tunica vaginalis itself is a matter of common observation at any operation performed for the relief of

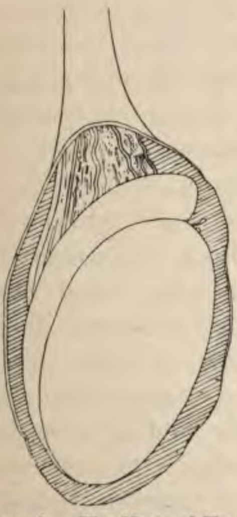


FIG. 1.—The Normal Testicle in the Tunica Vaginalis, part of which has been removed.

the condition. The membrane is seen to be thicker and more opaque than it is when examined during the operation for the radical cure of herniae. It cannot be said whether this subacute inflammatory condition of the tunica vaginalis is primary or secondary to the hydrocele ; but it would appear to be almost always the latter ; so that the question of the causation of the common hydrocele must be looked for elsewhere than in the tunica vaginalis. The common hydrocele may be symptomatic of some chronic inflammatory changes in the testicle. But in the majority of cases it cannot be explained in this way. It must depend upon the vessels of the spermatic cord ; and as these vessels have for their prime function the nourishment and care of the organs upon which the continuity of the race depends and upon the possession of which the individual bases his right to exist, it becomes obvious that the occurrence of the ordinary hydrocele, which occurs in later life, must be connected with some vascular conditions which accompany the decline in the cycle of sexual changes. The common hydrocele is usually found in men of forty-five, and older. In them the natural and healthy phase of sexual activity should be declining and its decline must be accompanied by changes in the glands and vessels. From an incomplete series of observations, I was led to the belief that this change was to be found in the spermatic artery. The walls of this vessel become thickened and atheromatous, diminishing its calibre and therefore the amount of arterial blood which reaches the testicle. Consequently, there must be a decline in the valuable activity of the gland which may even undergo fatty changes, such as we know occur after ligature of the spermatic artery. In the heyday of its activity, the rich arterial blood supply of the testicle demanded many veins for the depletion of the gland. Hence the appearance of these veins, and perhaps of a varicocele, at puberty. As in later years the spermatic artery becomes narrowed, no similar change occurring *pari passu* in the corresponding veins, the blood stream in them becomes slower and more sluggish; the testicle and its membranes becoming passively congested. Passive congestion leads ultimately to chronic inflammation, which of the tunica vaginalis will cause its thickening and perhaps the formation of a hydrocele. Such an explanation might suggest a more general frequence of vaginal hydroceles; the fact that they are often one-sided, or may not appear at all, may be a natural variation of the processes of sexual decline like the various colours or heights of individuals.

Thus I would put the vaginal hydrocele of late life on a very different footing from that which occurs at an earlier date. At any time of life, but particularly in middle age, the hydroceles may be symptomatic of some disease of the testicle such as syphilis, tubercle, chronic inflammation or growth. Or they may occur as the result of some thrombosis or injury to the veins of the spermatic cord. There are also diseases of the tunica vaginalis, and there is no trace of doubt that they do sometimes account for the formation of hydroceles.

Sometimes, especially if there has been some local injury to a hydrocele such as in tapping, the fibrinogen breaks down and small masses of fibrin are found on the injured part. These may be removed by the aid of leucocytes ; or as the result of movements, they may be rolled into bodies somewhat like the "melon seed" bodies found in teno-synovitis. A common method for these to arise is in the local inflammation that seals the small wound made in tapping the hydrocele. They have been commonly accused of causing the early and frequent reaccumulation of fluid after tapping a hydrocele. Sometimes they have been a source of pain. And sometimes they can be seen as shadows when examining the translucency of a hydrocele.

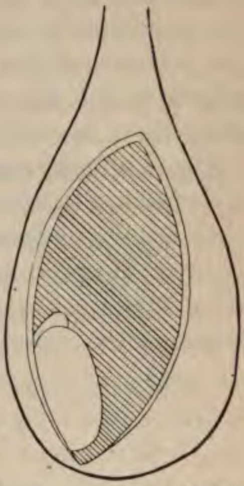


FIG. 2.—A Vaginal Hydrocele. Part of the tunica vaginalis has been removed to show the testicle.

It seems wrong to attribute the rapid reaccumulation of the hydrocele to these bodies. They should be regarded not as the causes of this, but as symptoms in an hydrocele of a more inflammatory nature than usual, and therefore one which will not respond to treatment by tapping, refilling rapidly. Thus the presence of these bodies becomes an important indication for the cessation of palliative and the adoption of operative treatment.

Signs and Symptoms.—From a long series of observations, conducted mainly during 1901 and 1902 on the patients applying for treatment at St. Thomas' Hospital and extending over a series of about 300 cases, the author has been enabled to construct the following table :—

Hydrocele on the left side . .	56 per cent.
,, ,, ,, right side .	40 ,, ,,
,, ,, ,, bilateral . .	4 ,, ,,

Its most frequent post-operative occurrence was after that for varicocele ; when a tense hydrocele, such as was known to the patient, was present in 8 per cent., and a flaccid hydrocele, unknown to the patient, was present in 15 per cent. of those examined after operation (see pp. 194–210).[1] When unilateral, a hydrocele forms a pyriform swelling in the scrotum with the blunt end directed downwards. It is smooth to the touch and elastic. The fingers can grasp the spermatic cord above the swelling and define the margins of the external abdominal ring, proving that the swelling does not come out of the abdomen. It often gives a slight impulse on coughing, is dull on percussion, sometimes imparting a thrill. It is almost always translucent to a strong and carefully directed light, but the translucency varies much with the thickness of the skin, subcutaneous tissue of the scrotum, and the tunica vaginalis, and the character of the contained fluid. In demonstrating the presence of a symptomatic hydrocele by means of transillumination, the hand which is used to render the hydrocele and skin tense must prevent the fluid collecting at the bottom or back of the scrotum, by squeezing it up above the testicle where the translucency can be demonstrated. If the increase of size is slow, the course of the disease is painless; the patient experiencing a little discomfort from the size of the swelling and a dragging sensation from its weight.

---

[1] "The Immediate and Remote Results of the High Operation for Varicocele," *British Medical Journal*, 1906, i. pp. 191-193.

If bilateral, the swelling is not pyriform but rounded or oblong. As the swellings increase in size their weight drags the skin downwards from the pubes, concealing the penis. In fact, that organ may disappear in a tunnel of skin, in which case there is liability to be much trouble from the excoriation produced by the urine not being projected clear of the body.

The **Diagnosis** is usually easy, but it is necessary not only to recognize the hydrocele but to exclude certain other things. It is therefore desirable to discuss the subject briefly.

1. **Hernia.**—It is impossible to grasp the spermatic cord above the swelling and to feel the unobscured margins of the external abdominal ring. A hernia, unless strangulated, when there would be symptoms of intestinal obstruction, has an impulse on coughing ; but in the case of an epiplocele (an omental hernia), this is not always recognizable. A hernia is not translucent like a hydrocele, except uncommonly in children. Besides these points there are the reducibility of a hernia and the irreducibility of a hydrocele, etc.

2. **Hydrocele in a Hernial Sac** (pp. 30–31).—By this is meant an effusion of fluid into the body of a hernial sac, the neck of which has become blocked by a plug of omentum or by adhesions. In this case the history of the presence of a hernia is of the greatest importance, the translucency of the swelling, perhaps its being distinct from the testicle and the fact that it is connected with the abdomen, as is proved by the swelling being felt to come out of the external abdominal ring, form valuable evidence.

3. **Solid Tumours of the Testicle.**—A hydrocele is more frequently mistaken for a gummatous testicle or sarcocele than *vice versa.* The mistake is purely the result of carelessness ; the examiner

having neglected to test for translucency. A little care is necessary to avoid misconstruing the small symptomatic hydrocele that may accompany these tumours.

4. **A Haematocele.**—This may be very difficult, as a haematocele not infrequently may complicate the course of a hydrocele; either as the result of some injury during tapping or from some blow or contusion. The skin over a haematocele may show ecchymoses. It differs from an elastic hydrocele in being more solid and heavy. A hydrocele is translucent, a haematocele is opaque.

5. **A Pyocele.**—The signs are rather like those of a hydrocele except for the occurrence of those of inflammation; such as, redness, swelling, tenderness and oedema of the skin of the scrotum as local signs and a raised temperature, etc., amongst the general symptoms.

6. **A Cyst of the Testicle.**—Cysts of the epididymis, particularly in elderly men, may grow so large and perhaps may be so numerous as to be mistaken for hydroceles. The testicle is usually distinguishable and separable from the swelling, unless it is obscured by small cysts.

The age at which a hydrocele declares itself is very important for two reasons. Firstly, in infancy the hydrocele is almost always connected with gastro-intestinal fermentation; in childhood and early adult life, it is very often concerned with some abnormal condition of the testicle or spermatic cord; later in life, it probably arises, in connexion with the vascular changes associated with the decline of the sexual activity of the gland. Secondly, as a hydrocele gets larger it stretches and separates the testis from the epididymis. In doing this the vasa efferentia and vessels to the testis, between them, are stretched and largely occluded. Hence a hydrocele should not be left to grow in young subjects because it will slowly put an end to the external secretion of the gland, and later, to the internal as well. In older subjects this is not of such importance.

Treatment.—Treatment should always be directed to the cause, such as the improper feeding of infants, diseases of the testicle or spermatic cord. When the cause cannot be treated, as in the hydroceles of the elderly, the practitioner is reduced first hand to treating the symptom, the hydrocele, instead. This may be done in several ways which will be considered *seriatim.*

Stimulating ointments and discutients sometimes help to cure the hydroceles of children, but never seem to affect those of adults.

Tapping a hydrocele is a purely palliative measure. The position of the testicle is ascertained so as to avoid inflicting an injury on it. The skin is carefully cleansed and a trocar and cannula of suitable size boiled. The surgeon then makes the skin of the scrotum tense and selects the site for the tapping. Guarding the trocar with his finger, it is thrust sharply into the hydrocele in an upward direction. The trocar is then withdrawn and the fluid evacuated; after which the cannula is withdrawn and the wound sealed with wool and collodion.[1] During the years 1901 and 1902, the author made careful notes on fifty cases of tapping, many of which were tapped more than once; in fact, amongst them there were 234 tappings. The longest period between the tappings was two years, which occurred twice, once in a man of fifty-eight and once in a man of sixty-seven. The shortest time was six weeks in a youth of seventeen. The majority of these fifty men expressed themselves as satisfied with the treatment and wanted nothing more. The

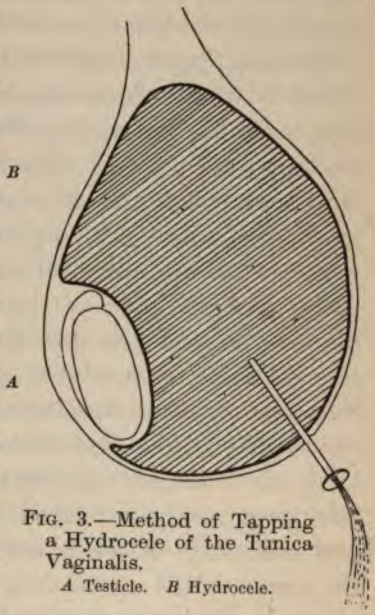


Fig. 3.—Method of Tapping a Hydrocele of the Tunica Vaginalis.
A Testicle. *B* Hydrocele.

---

[1] See *Operations of General Practice* (Oxford Medical Publications).

average period between the tappings, for the 234 instances, was about six months. But an important, but not invariable, point was noticed. The intervals of recurrence were shorter in young subjects than in those over fifty years of age; indicating that this palliative treatment is more suitable to elderly subjects than to others.

Tapping and Injecting.—Injecting is easily combined with the former operation and very considerably improves the results, whilst it gives little more trouble to the patient. The best substance to inject is pure carbolic; that is to say, 10 parts of carbolic to 1 of glycerine. The reputed object is to promote cure by causing universal adhesion of the parietal to the visceral layer of the tunica vaginalis. For obvious reasons it is rare to have the opportunity of examining a specimen after death. Certainly there are museum specimens showing such a universal adherence. But clinically, we know—(1) that the method not infrequently fails; (2) that occasionally we get only partial obliteration of the cavity and recurrence of the hydrocele in the remainder; (3) some of the apparently cured cases give the examiner the impression that the gland is not bulky enough and is too freely movable for the layers to be universally adherent. Hence it would seem that cure can be effected without these universal adhesions; probably on account of some alteration in the physiology of the serous membrane. The little operation is conducted as in the first stages described under **tapping**.[1] But the cannula is not withdrawn and a syringe, which fits it, is filled with a drachm of 10 in 11 carbolic in glycerine, which is injected through it into the cavity of the tunica vaginalis. The patient experiences no more than a sensation of warmth. The cannula is withdrawn, the wound sealed, and the scrotum manipulated to allow the carbolic to come into contact with all parts of the serous membrane. The patient should remain in bed for at least a day. Carbolic is preferable to iodine as an injection for three reasons: it is less painful, more sure, and more quick, only keeping the patient from his work for a day or two. The frequency of recurrence of the hydrocele after injection varies a good deal in different hands; it would seem to be about 25 per cent. after the use of iodine and about 15 per cent. after that of carbolic.

Amongst 200 cases admitted to St. Thomas' Hospital during the twelve years up to 1904, the operations selected by the different surgeons for the condition of hydrocele is indicated in the following table:—

Tapping and injecting	8	per cent.
Incision and packing	12·5	,, ,,
Partial excision of the tunica vaginalis	69	,, ,,
Ditto, with drainage	4	,, ,,

---

[1] *Operations of General Practice.*

Extroversion of the tunica vaginalis	6 per cent.
Removal of the tunica vaginalis with Orchidectomy . .	·5 " "

It will be more practical to consider the uses of these operations in order of the frequency in which they were performed.

Partial Excision of the Tunica Vaginalis.—This operation is popular on account of the good results it gives. Recurrences after it are known but are rare. Operation is particularly indicated, if injections have failed or if the sac has stiff thick walls, in order to examine the testicle and exclude any disease of it, or to remove bodies in the cavity of the tunica vaginalis, and in young subjects to save the testis from atrophy. The patient's convalescence will be at least a week or ten days. If recurrence should occur, a new sac will be found to have been formed. It is undoubtedly the best of the operations performed

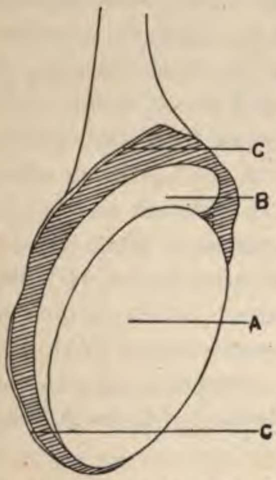


Fig. 4.—The parts after the operation for the Radical Cure of Hydrocele.
A Testis.
B Epididymis.
C Cut edge of parietal tunica vaginalis.

for the relief of hydrocele. It is wiser to suture the wound than to drain it.

Incision and Packing.—An incision is made so as to open the tunica vaginalis, whose walls are attached to the skin by two or more stitches. Its cavity is then lightly packed with gauze. The object of the operation is to cause adhesion between the parietal and visceral layers of the tunica vaginalis, rather than to make the cavity close by granulation. It is not so good as the partial excision, the removal of the packing causes pain as does its reposition, and the more remote results are not so good as are those of the previous operation. It has this advantage, it is easier and safer in less experienced hands.

Tapping and Injecting have already been discussed at length, p. 14.

Extroversion.— In this operation the tunica vaginalis is not opened until it has been dislocated from the scrotum through the incision. It is then opened freely, turned inside out and retained in this position by a stitch. This operation is much done in India. It does not require much skill or practice, and owes its popularity to its only taking a few minutes. But it leaves a bulky and inartistic mass in the scrotum, leaving the patient in consequence dissatisfied.

CONGENITAL HYDROCELE

A congenital hydrocele means a collection of fluid in the tunica vaginalis which is connected by a patent processus vaginalis with the peritoneal cavity. The presence of this communication can be demonstrated by the greater thickness of the spermatic cord above the hydrocele than that present on the other side. The canal of the process may be so small that the fluid in the hydrocele is apparently irreducible. But it is often possible to elicit from the mother or nurse that the swelling is less tense after the child has been lying down for some time, as when asleep; some of the fluid having percolated from the sac to the abdomen; and further, that it slowly becomes more tense after the child has been up some time. According as the size of the processus vaginalis varies, it is possible or impossible to regard this form of hydrocele as a hydrocele in a hernial sac. Thus clinically it may be impossible to exclude the presence of a hernia. With a patent processus vaginalis, a hydrocele may arise in two ways: one, from the abdomen; and two, on account of disease of the tunica vagin-

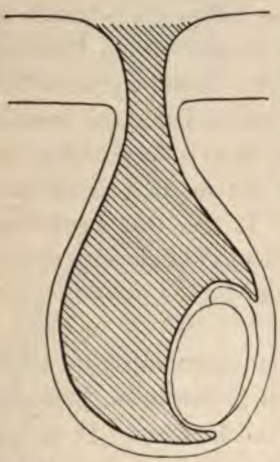


FIG. 5.—A Congenital Hydrocele.

alis or testicle. The former is due in the vast majority of cases to the irritation of the peritoneum over the bowel on account of gastro-intestinal disturbances [1]; occasionally, it is due to tuberculous peritonitis. In the latter, the disease of the testis is more frequent than that of the epididymis and that disease is almost invariably tubercle; occasionally, tuberculous peritonitis starts in the quiet ' back-water " formed by a hernial sac.[2]

The diagnosis is as a rule very easy and the treatment must be directed to the cause. The diet must be rectified and the intestinal tract emptied and cleansed. It must be remembered that the stomach of a child which has been used to " brickbats " will resent having to content itself with proper diet; a fact which is apt to create a difficulty in the maternal mind. Injection treatment must not be used, but if the fluid persists, the hydrocele should be dealt with by operation and the processus vaginalis divided and ligatured through an inguinal incision.

INFANTILE HYDROCELE

In this form, the tunica vaginalis and the processus vaginalis communicate with each other but are shut off from the peritoneum. In fact the infantile differs from the congenital hydrocele solely in being shut off from the peritoneum. The fluid which they contain is derived from the tunica vaginalis. The hydrocele is translucent and irreducible, never changing tenseness with varying positions. In the chapter on the "Movable Testicle," p. 51, the relation of these abnormal organs, and such as have not quite fully descended, to infantile sacs has been pointed out; so that the condition of infantile hydrocele should always raise the suspicion of some imperfection in the development of the testicle, which would account for the relatively high position of the tunica vaginalis (Fig. 7, p. 23).

---

[1] " Some Surgical Results of Improper Feeding," *Clinical Journal*, 1906, pp. 171–176.

[2] As a rare example of a similar affection may be quoted "A case of Tuberculosis in a Diverticulum of the Bladder found in an Inguinal Hernia," *Clinical Society's Transactions*, 1905, xxxix, pp. 21–25. (Reported with Mr. Cecil Rowntree.)

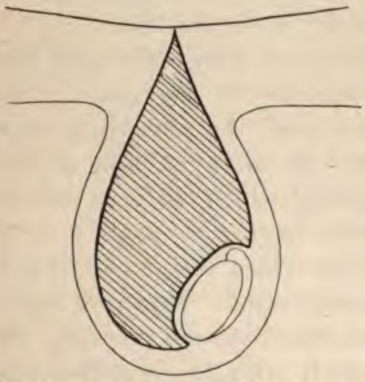


FIG. 6.—An Infantile Hydrocele, consisting of the tunica and processus vaginalis which do not communicate with the peritoneum.

In infants these hydroceles can be treated by tapping, after which the condition of the testicle should be examined and watched or treated as is desirable. It may be advisable to suture the gland in the scrotum. In boys and adults the best treatment is partial excision of the sac, when the testicle can be examined and dealt with accordingly. This type of hydrocele is particularly liable to cause dilatation of the inguinal canal which may be followed by the protrusion of a pad of subperitoneal fat (Fig. 14, p. 55) and perhaps to the development of a hernia (Fig. 15, p. 57). Under these circumstances—the chances of a testicular anomaly being present and the possible development of a hernia; it is unwise to defer the radical treatment of an infantile hydrocele.

An infantile hydrocele is much less frequent than a congenital one, from which it differs in the irreducibility of its contents, and its tenseness not varying with the recumbent position, as in the morning after sleep. On examination, the cord above the testicle feels uniformly thickened, as by the presence of a smooth regular tube full of fluid, in a congenital hydrocele; with an infantile hydrocele, the thickening is not even but gets less and less as it proceeds upwards. Should there have been a protrusion of subperitoneal fat or the development of a hernia, the upper part of the infantile hydrocele will have been pushed downward out of the inguinal canal.

Doubtless there are cases which are intermediate between congenital and infantile hydroceles, as when there is a very fine communication between the hydrocele and the peritoneal cavity; but so fine as only to be recognized clinically with great difficulty. In these cases, the fluid comes from the abdomen and is not formed locally by the tunica vaginalis. It is the result of chronic gastro-intestinal fermentation which must be treated by proper diet and laxatives.[1] Recognizing this difficulty in diagnosis, the practitioner will do well to treat an infant with proper diet, laxatives and perhaps some scrotal discutients, to promote the absorption of the fluid, such as tincture of iodi. Later on, a puncture should be used. But this treatment must not be employed for long because a growing hydrocele stretches the mesotestis or mesorchium, which contains the vasa efferentia and the vessels of the testis, causing the atrophy or non-growth of the gland and the partial sterilization of the patient.

THE INGUINAL HYDROCELE

The inguinal hydrocele is that associated with an imperfectly descended testicle. The sac may be of either the congenital or infantile shape. In fact the opinion has been freely expressed that many cases regarded as examples of infantile hydrocele are really associated with imperfectly descended testicles and are therefore inguinal hydroceles. The fluid in the inguinal hydrocele is either of abdominal or local formation according to its sac. If abdominal, it is associated with gastro-intestinal fermentation and must be treated accordingly. If local, it may be due to some disease of the testicle as tubercle, the result of orchitis to which an imperfectly descended gland is so prone on account of its position, the result of an injury or of torsion of the spermatic cord or mesorchium. For explanation the reader must refer to the chapters upon "Torsion of the Spermatic Cord," pp. 106–122, and "The Imperfectly Descended Testicle," pp. 62–79. One clinical sign of great importance is the association of pain or attacks of pain with the formation of a hydrocele. Its presence indicates the local formation of the fluid in the hydrocele, on account of the occurrence of some accident, traumatic or otherwise, to the testicle. The disastrous results of the frequent repetition of small accidents to the gland have been discussed at length in the sections to which reference has been made.

---

[1] "Some Surgical Results of Improper Feeding," *International Clinics*, 1906, iii, pp. 207–217.

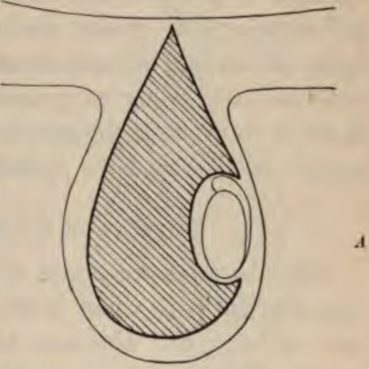


FIG. 7.—An Inguinal Hydrocele. Note the imperfectly descended position of the testicle, *A*.

The diagnosis is generally easy; though previous to operation, it is often impossible to differentiate between an inguinal and an infantile hydrocele. An inguinal hydrocele has an even greater likelihood of leading to the dilatation of the inguinal canal and to the formation of a hernia. Considering this and the practical certainty of irreparable damage to the testicle, if the condition is allowed to remain; to make the diagnosis of inguinal hydrocele should be tantamount to advising operation with as little delay as possible. Indeed, sufficient damage to prevent the growth and maturation of the gland may have been inflicted already.

BILOCULAR HYDROCELES

Bilocular hydroceles are of two kinds: the more frequent form is when both chambers of the sac are without the abdomen; the rarer when one sac is without and one within the abdomen or the abdominal wall. In the former class the constriction is commonly produced where the external pudic vessels cross the upward extension of the sac; they will be aided by some inflammatory changes. In some cases the upper loculus may extend as high as, and even above, the umbilicus. The best treatment for these, if repeated tapping will not suffice, is to excise as much of the sac as is possible.

In the latter class of bilocular hydroceles, where one loculus is abdominal, the only reasonably frequent form is when it is associated with imperfect descent of the testicle. The upper loculus may be in one of four situations. It may be: (1) between the skin and the tendon of the external oblique muscles, lying over the inguinal canal and external to the external abdominal ring; the most frequent form of this class of bilocular hydrocele; (2) it may be between the layers of the abdominal muscles, usually on the outer or superior side of the inguinal canal rather than on the internal: (3) it may be in front of the peritoneum between it and the transversalis fascia; either in the iliac fossa or by the bladder; or (4) it may bulge into the peritoneum. For further information, the reader is referred to the sections upon the various hernial sacs which are associated with the imperfectly descended testicle, pp. 74–76.

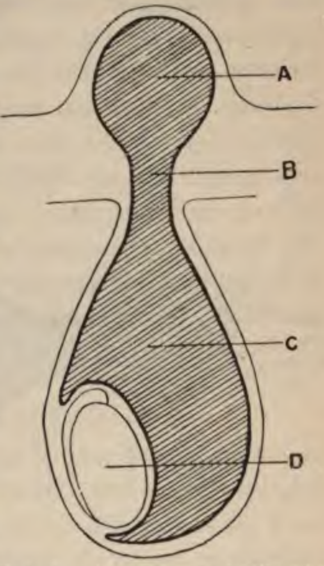


FIG. 8.—A rare form of Bilocular Hydrocele with intraperitoneal loculus, *A*, which communicates by a neck, *B*, in the inguinal canal, with the tunica vaginalis, *C*. *D* is the testicle.

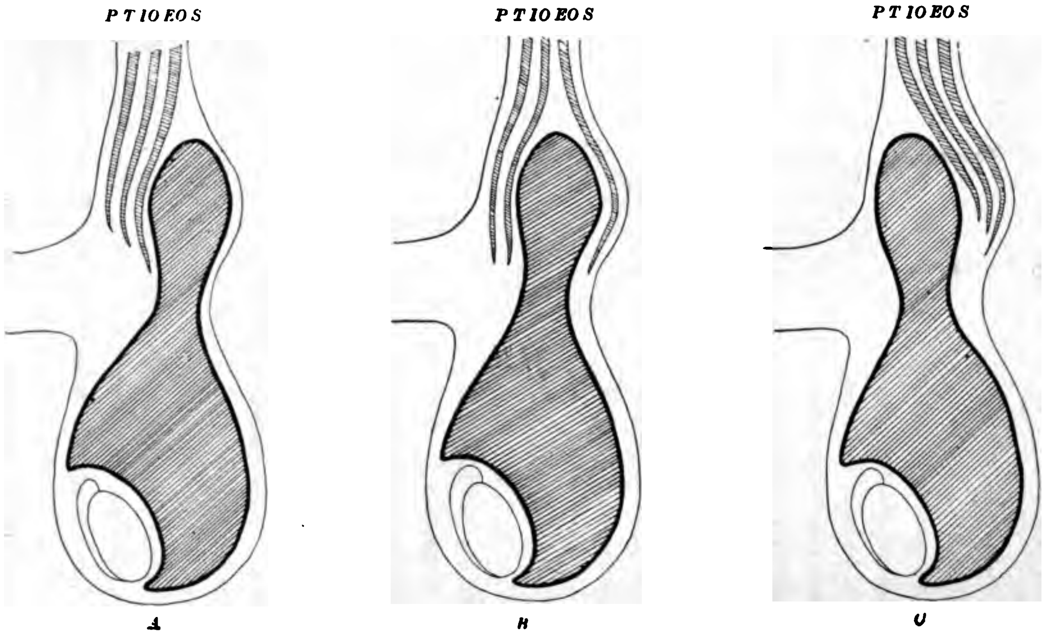


FIG. 9.—Interstitial Sacs.

A The upper part of the sac lies between the skin and the external oblique, the most common form. *B* The upper part of the sac lies between the external and internal oblique muscles. *C* The upper part of the sac lies between the muscles and the peritoneum. *P* Peritoneum. *T* The transversalis. *I O* The internal oblique. *E O* The external oblique. *S* The skin.

The diagnosis is either very easy or very difficult to make. Even at the operation it is by no means easy to diagnose an intraperitoneal loculus to the hydrocele. In the very young a trial of diet, etc., should be given and if this is not quickly satisfactory, operation, with removal of the sac and suitable treatment for the testicular anomaly if present, should be recommended. In older and elderly subjects tapping may be tried ; and if the patient is not satisfied, operation must be advised. An operation upon the intra-abdominal loculus of one of these hydroceles will necessitate opening the inguinal canal and may require much skill and care in manipulation.

CHYLOUS HYDROCELE

The fluid in a hydrocele is sometimes white like cow's milk. Such hydroceles are called chylous. Occasionally the fluid is more like pea soup than milk. On standing a kind of cream separates. In its causation the chylous hydrocele is associated with lymphatic obstruction, which may be of parasitic or traumatic origin. Tapping and injection are useless in this affection ; the best results of treatment have been obtained by incision and removal of part of the sac. The blood should always be examined for filaria and the scrotum for early elephantiasis. But cases of lymph scrotum occur without any chylous hydrocele. In the case of the scrotum the lymphatic obstruction will be in the groins along the superficial lymphatics ; with the chylous hydrocele it must be along the pampiniform plexus of veins, i.e. the deep lymphatics. Hence it is that chylous hydroceles need not be associated with elephantiasis of the scrotum.

SPERMATOCELES AND HYDROCELES OF THE TESTICLE

The name hydrocele is given to certain cysts which arise in connexion with the testicle. That of spermatocele is reserved for those cysts which contain spermatozoa. The fluid within them is either milky or opalescent ; sometimes the spermatozoa are active, at others quiescent, and frequently they are broken up into head and tails ; and finally, there is reason to believe that they can disappear altogether. In consequence, there is no line of demarcation between spermatoceles and hydroceles of the testicle. They are very rare before puberty, becoming slowly more frequent as life advances. The majority of patients are over forty-five years of age. Clinically they exist in three varieties : small multiple cysts, large solitary cysts, and a combination of these two, with cysts of all sizes. Apparently, they are retention cysts and are correlated with general or local fibrosis of the testicle. The solitary cysts are usually found above the testicle and in the younger subjects.

As a cyst grows it may lose its attachment and become dislocated into the groin by the movements of the legs. Then they may show no sign of their origin unless the fluid within them shows indications of spermatozoa. Clinically, the large cysts are easy to diagnose; on account of the cord being free above them, their irreducibility and their translucence. Sometimes their attachment to the testis or epididymis can be felt. When very numerous, they are sometimes diagnosed as hydroceles of the tunica vaginalis. When tapped, one cyst alone is emptied; the character of the fluid withdrawn may indicate its origin; or, having emptied one cyst, others, which are translucent, can be felt. As the large ones are emptied or removed, the smaller cysts will grow and the condition recur. The patient may suffer from dragging, and occasionally neuralgic pains. Or when the cyst is single, it is commonly discovered in the course of an examination, the patient having been unaware of its existence. Simple tapping fails to cure these cysts. Tapping and injecting is not nearly as successful with these cases as with vaginal hydroceles. In fact, it is best to advise the excision of the cysts. When these are of the combined large and small type, probably the operation will need to be repeated. If only small cysts are present they will require little more attention than the application of mercurial ointments.

A HYDROCELE IN A HERNIAL SAC

A Hydrocele in a Hernial Sac presents itself both amongst the hydroceles of the cord and of the scrotum. The neck of the sac has either become shut off by adhesions or plugged with omentum, rarely bowel. The points to be relied on, are the history of the hernia, the evident continuity between the scrotal swelling and the abdomen and its translucency, to indicate its true origin. It might be confused with the rare embryonic cystic tumours of the

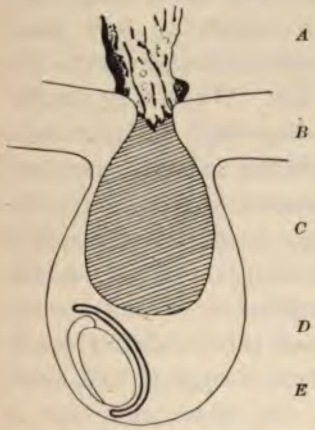


FIG. 10. — A Hydrocele in a Hernial Sac, the neck of which has been plugged by a piece of adherent omentum, *A*.

A Omentum.
B Neck of sac.
C Hydrocele in hernial sac.
D Tunica vaginalis.
E Testicle.

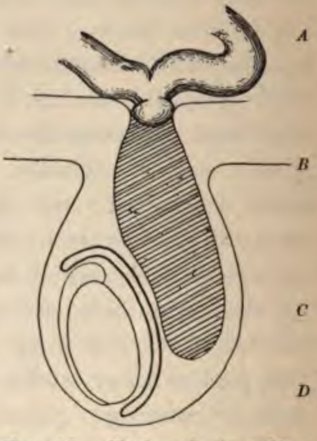


FIG. 11.—Hydrocele in a Hernial Sac, *B*, the neck of which has been blocked by a coil of bowel, *A*, in such a way as not to interfere with the passage of its contents and cause intestinal obstruction.

C The tunica vaginalis.
D The testicle.

cord described p. 211. To make the diagnosis of a hydrocele in a hernial sac is tantamount to advising operation because, clinically, it is impossible to decide what structure is blocking the neck of the sac. For instance, it is impossible to exclude that the neck of the sac is plugged by a somewhat oedematous piece of the wall of the colon, in such a way that the canal of the bowel is in no way obstructed. Hence there will be no sign of intestinal obstruction. Such a hernia was described by Richter and is sometimes called after him; a better name is "partial enterocele." Under these circumstances, tapping and injecting the hydrocele must never be done.

THE EFFECT OF A HYDROCELE ON THE TESTICLE

The prolonged presence of a hydrocele affects the testicle differently according to the age of the patient. In the older subject the testicle becomes elongated and flattened, the testis suffering more than the epididymis. At the same time, it undergoes fibrosis which must in time lead to the physiological uselessness of the gland. In young subjects there is, in addition, another effect. In them, the hydrocele drags the epididymis from the testis, making the mesorchium tense. As the vasa efferentia and the vessels to the body of the testis lie between the layers of the mesorchium, they also are pulled tight. With the result that, in due course, the testicle will become sterilized. Probably, after this, it becomes flattened and fibrosed as has been described above. Hence it is a matter of some importance that a tense hydrocele in a boy should not be allowed to persist. The presence of 60 per cent. of small lymphocytes in the fluid, examined cytologically, would indicate that the persistence of the hydrocele was due to tuberculosis. Hence it is advisable that such an examination be made.

CYTOLOGICAL EXAMINATION OF HYDROCELE FLUIDS

Of recent years the examination of the cells present in the various fluids of the body has been used in clinical work to aid in the differentiation of disease. With regard to hydroceles the conclusions can be stated very briefly. In all acute inflammatory conditions, the finely granular polymorpho-nuclear cell will be found, except in the case of some gonococcal infections. But it is not often that difficulties will arise over acute inflammatory conditions, but rather over the subacute or chronic. In these cases two questions will arise in the practitioner's mind : one, is it tuberculous ? two, is new growth present ? In the first case, a cytological examination is of the greatest value ; in the second, it gives no help. If 60 per cent. of small lymphocytes are found, then there is a very strong probability that tuberculosis is responsible for the hydrocele. In the hydroceles of young subjects this is often a very important question and a cytological examination is often most useful. The fluid in an old chronic hydrocele may show cells to be absent, or, if any are present, they are found to be endothelial cells. It may be important to know if a hydrocele communicates with the peritoneal cavity. The absence of cells in the fluid or the presence of endothelial cells would indicate that it does, unless the hydrocele be an old chronic one.

The following is a very brief account of the method of conducting a cytological examination.

The fluid for examination is best received direct from the cannula into a clean glass vessel. A large test tube does well. Either allow the fluid to stand four hours to allow the cells to settle to the bottom or centrifuge at once using moderate speed. Prepare films on cover glasses from the sediment obtained. Avoid unnecessary manipulation with the platinum needle while making the films or the cells will get damaged. Dry in air. From a drop bottle pour on sufficient of the Leishman blood stain (0·5 per cent.) to cover the film. Allow it to remain one minute to fix the film. Add to the cover glass distilled water from a pipette mixing twice the volume of water with the stain. Allow to remain seven minutes. Pour off stain. Add distilled water to cover the film for two minutes. Wash by dipping into distilled water. Dry on cigarette paper. Mount in balsam. Examine first with a $\frac{1}{6}$th and then with a $\frac{1}{12}$th lens. A count should be made of at least 300 cells under a $\frac{1}{12}$th oil immersion lens.

The principal cells to look for are the polymorphonuclear cell, the small lymphocyte, the endothelial cell, and occasionally the coarsely granular eosinophile cell. It must be noted that a certain number of red blood discs are always present, especially after centrifugation, and are of no importance.

Messrs. Burroughs & Wellcome put up the Leishman stain in tabloid form to meet the requirements of the practitioner. With the above stain, cell nuclei become a deep blue with an evident slight reddish tinge superadded. The fine granules in the protoplasm of the polymorphonuclear cells are pale pink. Eosinophile granules take on a deeper pink line, and basophile granules stain in the same manner as the nuclei.

HAEMATOCELE

A haematocele, as its name implies, means a haemorrhage into a cavity which already exists ; such as the tunica vaginalis, in connexion with which the term is most often used. Thus, a haematocele is a haemorrhage into an existing cavity and a haematoma is a haemorrhage which makes a cavity for itself. This is the commonly accepted meaning of the term, and it scarcely needs pointing out that the term haematoma, blood tumour, includes haematoceles. A haematocele is almost always traumatic in origin, as the result of a blow or of the unskilful tapping of a hydrocele. Its presence may also be due to, in rare instances, malignant growth of the testicle. The withdrawal of fluid from a hydrocele, by removing the support of the capillaries in the tunica vaginalis on one side, may be followed by haemorrhage and the formation of a haematocele. This is particularly likely to be the case when the fluid is withdrawn quickly. Yet, I have never heard of capillary haemorrhage from the surface of the tunica vaginalis when the fluid has been removed very rapidly by incision as in the first stages of the operation of partial excision. Hence I would regard the formation of haematocele after tapping, most probably, as due to the accidental or unavoidable wounding of some internal vein, or, rarely, as due to disease of the vessels. As the result of straining, the capillaries of the tunica vaginalis sometimes give way, but not unless some hydrocele is already present. A haematocele, which is the result of the bleeding diathesis, haemorrhagic fevers, blood disease and other general conditions, is a very rare event.

As its name implies, a haematocele may occur on account of injury to any hydrocele. Thus there are vaginal, congenital, infantile and inguinal haematoceles (Figs. 2, 5, 6, 7); of which only the latter deserves special mention on account of its particular and frequent relationship with the torsion of the spermatic cord of an imperfectly descended testicle. Similarly, there are bilocular haematoceles, diffuse haematoceles of the cord and haematoceles of a hernial sac.

Besides these there is one situation in which a haematocele occurs, but in which a hydrocele has never been described ; when it is between the skin of the scrotum and the tunica vaginalis, a collection of blood is called a scrotal haematocele. The scrotal, the inguinal, and the haematoceles connected with hernia sacs are reserved for special mention (Figs. 39, 40 and 41).

Pathology.—If the effusion is slow, the blood clots and coats the walls of the tunica vaginalis with layers of fibrin in which are entangled many red and white corpuscles. When once out of its vessels, blood becomes a foreign body in the tissues and excites in them the changes of inflammation. Thus the walls of the cavity in which the blood has been effused become subacutely inflamed. The fibrin, the blood pigment and the red cells themselves are removed by the leucocytes, whilst young connective tissue with new young blood vessels grows from the walls of the cavity. Thus the clot is removed and partly replaced by connective tissue which makes the walls much thicker. If the effusion is more rapid, these inflammatory processes have no chance until the haemorrhage is stopped by its own pressure in the haematoma. In older haematoceles the walls of the sac may become calcareous and even cartilaginous.

Symptoms.—A haematocele may form slowly or quickly, according to the rapidity with which haemorrhage is taking place into the cavity: if slow, it is painless; if rapid, it is painful. The swelling increases in size and weight, decreasing in translucency as the haemorrhage progresses. The effused blood is slow to clot, and, if it is present in quantity, still slower to organize. The surface of the swelling is warm and becomes less uniform and regular as the blood clots. Later, it becomes less tense as the plasma is absorbed and the old clots may be felt as masses in the scrotum. The skin over a haematocele is sometimes ecchymosed and, more often, the dark colour of the blood can be seen through it. Unless infected, there will be no suppuration.

Diagnosis.—A haematocele must be distinguished from three main things:—

1. A hydrocele; by means of its opacity, greater firmness, ecchymosis, etc.

2. A hernia; by means of its not entering the external abdominal ring, having no proper impulse on coughing, etc.

3. A tumour of the testicle; by means of the history, presence of an ordinary testis, etc. This

third question may be so difficult as to be only settled by means of an exploratory incision.

The practitioner should always remember the possibility of a **haematocele in a hernial sac,** which will enter the external abdominal ring and is probably distinct from the testicle.

The treatment may be palliative or curative. The former consists of rest in bed with the scrotum raised and supported, an icebag or cooling lotions, etc. ; followed, when the haemorrhage has ceased, by warmth to stimulate the circulation to remove the clot. If the haemorrhage does not stop, the swelling must be incised and the vessel ligatured. If the absorption, after the bleeding has stopped, is slow, the swelling should be tapped to remove all fluid parts. This tapping should never be repeated more than once or twice, but operation undertaken unless the patient's general condition forbids it. The operation consists, first, of incising the swelling ; secondly, of removing all blood, clot and "false" membranes ; thirdly, of excising the parietal part of the tunica vaginalis, or if by reason of external adhesions it cannot be removed it must be painted with pure carbolic or a solution (three grains to the ounce) of nitrate of silver. There is yet a final alternative—the subjects of haematocele are generally men well past middle life, so that if the testis is much wasted there need be no hesitation in curing the patient by removing it with the tunica vaginalis. It shortens the convalescence, and prevents all chance of recurrence.

A Scrotal Haematocele is either due to the rupture or puncture of some subcutaneous scrotal vein, as in tapping a hydrocele. The effused blood is between the tunica vaginalis and the dartos, usually below the testicle which is pushed up by the effusion. Occasionally a haematocele of the tunica vaginalis which has been produced by tapping a hydrocele may leak through the perforation made by the trocar into the subcutaneous tissues of the scrotum, forming both a vaginal and a scrotal haematocele which communicate with each other. A hydrocele corresponding to this has not been described (Figs. 39, 40 and 41).

Treatment as above.

An **inguinal haematocele** may be the result of an injury, but it occasionally occurs in young adults as the result of torsion of the spermatic cord. Reference must be made to that section of this book, pp. 106–122. As a result, operation is practically always demanded. That operation being in far the majority of instances, orchidectomy; uncommonly orchidopexy or orchidocoelioplasty. An inguinal haematocele may be a haematocele in a hernial sac.

A **haematocele in a hernial sac** may be acute, subacute or chronic. The acute are always due to the strangulation or torsion of some viscus (omentum or bowel) in the neck of the sac. Sometimes it is due to blood effused in the abdomen running into the hernial sac, as from a ruptured tubal gestation. In the subacute and chronic forms it is produced in a similar way with corresponding degrees of strangulation or torsion. As a rare example, I may quote the case in which a femoral hernial sac communicated with the saphenous vein as the result of a truss injury. These cases will almost always be diagnosed as complicated herniae, such as an obstructed hernia, and treated accordingly. If the diagnosis of haematocele in a hernial sac is made, operation must be advised in every case.

For haematomata or haematoceles of the testis and epididymis the reader is referred to the section on "Injuries of the Testicle," pp. 102–105.

PYOCELE

As its name implies, a pyocele is the formation of pus in an existing cavity. A "pyoma" or pus tumour is termed an abscess. It may result from general infective conditions, such as pyaemia, or be secondary to some abscess in the testicle or due to the introduction of sepsis from without. Except in the tunica vaginalis, a vaginal pyocele, which is very rare, any other form of pyocele is almost unknown except the scrotal variety where the pus lies between the tunica vaginalis and the skin (Fig.

39). In young men it is usually secondary to the suppurative epididymitis or orchitis of gonorrhoea ; in the old, it is secondary to prostatic or operative trouble. It may be due to the septic infection of some tuberculous focus. Like other abscesses, pyoceles must be opened and castration done if necessary. Extravasation of urine in the scrotal tissue will give rise to suppuration in the region of a scrotal pyocele amongst the widespread destruction it causes.

For pyoceles of the testis or epididymis, the reader is referred to the section on "Testicular Suppuration," pp. 133–135.

THE TUNICA VAGINALIS

Hydroceles, haematoceles, and pyoceles are in reality merely symptoms and not diseases *per se* ; which, in the history of surgery, have obtained a firm hold of the minds of medical men. In them, the tunica vaginalis has been seen subject to acute, subacute and chronic inflammations, both simple and septic. It is known that the same membrane may become tuberculous ; very rarely as a primary process, as an insignificant item inguinal miliary tuberculosis, and as a common and important factor in tuberculosis of the testicle. Its involvement in the last case is apt to show that the gland is suffering from extensive disease, though not necessarily so. At any rate the persistence of the hydrocele in a case of tuberculous testicle under treatment is a very important indication that the case is not progressing as it should, and that operation is in all probability indicated.

Bilateral hydroceles have been seen in secondary syphilis. The tunica vaginalis is sometimes involved in gummatous testicles or sarcoceles. Some instances of new growth of this membrane have been described, but there is so much difficulty in ascertaining the precise place of origin of the new growth that it does not seem worth while to collect the cases.

The tunica vaginalis is known to have a precisely similar list of diseases known to affect it, as has any other serous membrane in the body.

CHAPTER II

THE PHYSIOLOGY OF THE TESTICLE

Both the ovaries and the testicles are derived from the epithelium which lines the body cavity of the embryo ; and from that particular part which is situated along the inner side of the Wollfian body or primitive kidney. At first, the cells elongate and become columnar ; then each divides, forming two rows of cells ; in this way several rows may be formed. The changes are not confined to the cells which line the body cavity but the underlying connective tissue participates and becomes thickened ; forming, with the increased epithelium, the genital ridge. At this early stage in life the first traces of sexual differentiation can be noted. In the female sex, the germinal epithelium is several layers thick and grows down into the subjacent stroma in the form of columns of cells ; in the male, the germinal epithelium is not so thick and only small strands of cells grow down into the stroma. It will be observed that the distinction is in quantity rather than in quality. A good deal later, the testicle undergoes changes in position. During the sixth month of intrauterine life, it is approximately at the internal abdominal ring;

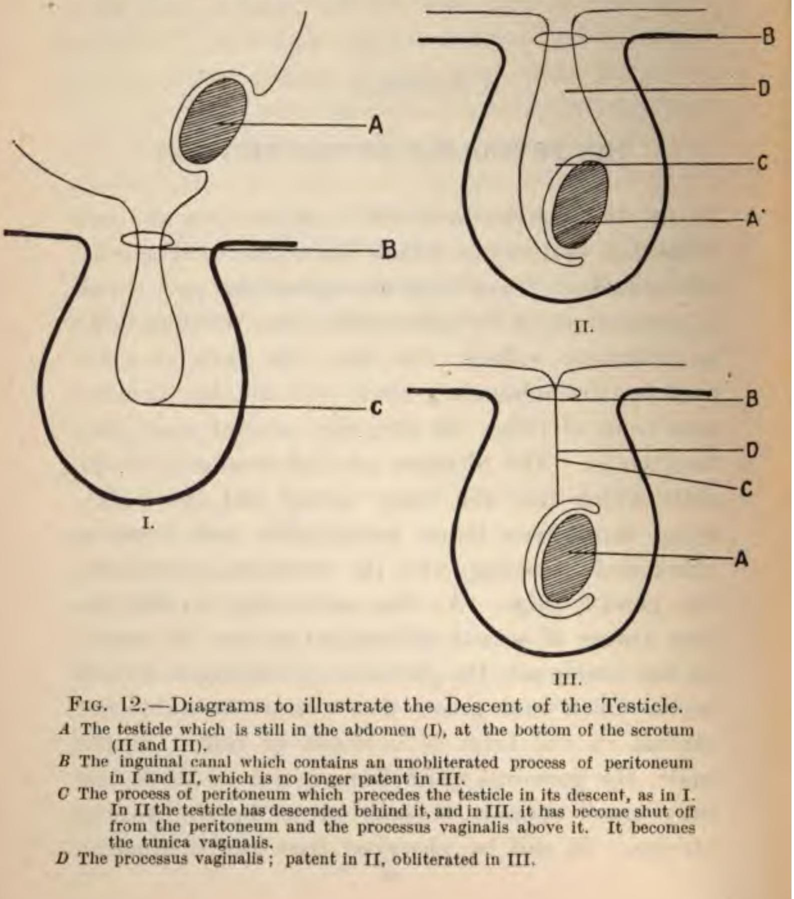


FIG. 12.—Diagrams to illustrate the Descent of the Testicle.

A The testicle which is still in the abdomen (I), at the bottom of the scrotum (II and III).

B The inguinal canal which contains an unobliterated process of peritoneum in I and II, which is no longer patent in III.

C The process of peritoneum which precedes the testicle in its descent, as in I. In II the testicle has descended behind it, and in III. it has become shut off from the peritoneum and the processus vaginalis above it. It becomes the tunica vaginalis.

D The processus vaginalis; patent in II, obliterated in III.

during the seventh month, it enters the scrotum, being fully descended at birth. The mechanism of this descent is twofold. The gubernaculum is a musculo-fibrous cord which is attached above to the testicle and below to the inguinal rings, the bottom of the scrotum and perhaps in the direction of the perineum or ischial tuberosity; it directs and, perhaps, pulls the testicle to its final position. The other mechanism is less popularly believed but is more probably true; the gubernaculum, which certainly exists, anchors the testicle and, not growing nearly so fast as the rest of the body, gradually draws it into the scrotum. In human beings, the gubernaculum is the remains of a structure which was physiologically active in our ancestors; for instance, in many animals the testicles only descend into the scrotum during the period of sexual activity. When the testicles lie normally in the scrotum, the agent which withdrew them from time to time from the abdomen becomes functionless and is only found as the gubernaculum. It is natural that a vestigial structure like it should not grow so fast as the physiologically active structures which surround it. Hence the method of the descent of the testicles in mankind.

The descent of the testicles may become stopped at any part of its course for two reasons: firstly, the conditions are such that the individual is incapable of further development, having no more embryonic capital left to call upon; secondly, there may be some real mechanical obstruction to the descent, such as a peritoneal adhesion. It may be delayed in its course within the abdomen or the inguinal canal, by the external abdominal ring or at the upper part of the scrotum. When in the inguinal canal it commonly enters between the different layers of the abdominal wall, such as between the peritoneum and the transversalis or between the layers of the muscles, forming examples of interstitial herniae. When the testicle is just without the external abdominal ring, it usually ascends the groin towards the anterior superior spine of the ilium between the skin and the external oblique, for reasons similar to those for which a femoral hernia rises in the same direction. In this situation, it lies over the inguinal canal. When the testicle has reascended towards the anterior superior spine, it leaves the spermatic cord behind it draped in a curve, the apex of which is in the upper part of the scrotum. Besides these situations, the testicle has been known to enter the crural canal as a femoral hernia, the perineum, the ischiorectal fossa or the inguinal canal of the opposite side and descend into the wrong half of the scrotum. Indeed a case has been recorded in which the two spermatic cords twisted round each other; but these curiosities need not delay us.

The imperfectly developed testicle differs in two very important details from one fully developed. For instance, the relative sizes of the body (the testis) and the epididymis. In the immature gland, the epididymis is relatively, markedly larger, and the testis correspondingly smaller. Attention to this point will be useful in deciding the value of a fully descended gland. The second point is that in the adult and perfectly developed organ, the epididymis is in contact with the testis. In the immature and imperfectly developed and descended gland, the epididymis is separated from the testis by a various interval, half an inch to an inch in length, bridged over by a mesentery, the mesotestis or mesorchium, containing the vasa efferentia and the spermatic vessels and nerves. This interval is of particular interest in connexion with the torsion or undue mobility of the gland.

A normal healthy testis has at least two distinct functions: one, the formation of an external secretion; the other, the production of an internal secretion. The external secretion, from the point of view of the race, is the more important as it contains spermatozoa, the production of which is the spermatogenetic function of the testis, enabling the individual to propagate his kind. The external secretion does not exist until puberty, twelve to sixteen years of age, when it begins to develop slowly; fully formed healthy spermatozoa are not found at once, only appearing a year or so later. When once full sexual vigour has been acquired, so far as is known, men retain it, though in a failing degree, even when in advanced years. With regard to the internal secretion, less is known. At first, it was assumed that the internal secretion was responsible for the development of all sexual characteristics apart from the differences in the generative organs themselves. These were called secondary sexual characters. For instance, there is the male voice, the growth of hair on the face as in the beard and moustache, the male chest, breasts, waist, pelvis, limbs, muscular development, mental traits and desires, etc. But on further inquiry, it was found that these characters began to develop before puberty, i.e. before the testes. So that the most which could be said was that the internal secretion only ministered to their full and perfect development or acquisition. Certain experiments confirmed this. For instance, there is the removal of the testicles in the castration of boys in the East to form eunuchs or to preserve their singing voices. These men are noticed to be deficient in male secondary sexual characters. In animals, similar facts have long been known amongst farmers and cattle dealers. Most recently of all, Messrs. Shattock & Seligmann have placed this popular knowledge upon a scientific basis. In their communication, they showed that removal of the testicles must be done and that mere division of the vas deferens is insufficient to bring about an eunuchoid condition. Thus the more our knowledge grows, the more do we find that the external secretion is for the race; the internal, for the individual. It is, therefore, possible to appraise the value of the normal testicle according to its power of producing spermatozoa and the point to which secondary sexual characters have been acquired by the individual. By the same methods, it is now possible for us to appraise the value of the imperfectly descended testicle and, also, of the operations performed for its relief.

Firstly, the imperfectly descended testicle is only in very rare instances known to have been capable of producing spermatozoa. Further, it is known that when this rare condition is present (and perhaps it exists more frequently than is thought), it is delayed until the individual is about twenty or twenty-two years of age and then only lasts for a year or so. By far the majority of cases of double imperfectly descended testicles are sterile or infertile; and for two reasons: one, in part congenitally so, the gland being incapable of producing spermatozoa; and secondly, in part the result of inflammatory changes in the gland, secondary to its position of imperfect descent. Still, the more fully descended the gland, the more likely is it to have a period of fertility; and the more or the longer a gland has suffered from its position, the less likely is it to produce spermatozoa.

If the lesion is unilateral, there need be no fear of necessary sterility or of the non-development of a sufficiency of male characters; and advice can be given accordingly. But to the expert eye there will always be some detrimental effect in the secondary sexual characters, such as delayed puberty, scanty hair on the face, high pitched voice, etc. In fact, the secondary sexual characters are a far more exact measure of the value of the testicular tissues than are the presence of spermatozoa in the external secretion. It may almost be said that a man's male plumage is in direct proportion to the weight or amount of testicular tissue present.

CHAPTER III

THE WANDERING OR MOVABLE TESTICLE

It is a matter of common daily observation at a large children's hospital that the testicles of the patients are capable of more extensive movement than are those of adults. In fact, a certain degree of mobility seems to be normal or physiological in the young. Yet we know, on the other hand, that the testicles of some babies remain in the scrotum and do not show such mobility. We know little, and until we know much more, the presence of considerable mobility of the testicles of children must be looked upon without anxiety. But when the movement is great, such as when the testicles disappear into the inguinal canals, it must be inferred that some abnormal conformation is present, especially so if the child is over four or five years of age. Further, it is necessary to remember that the persistence of an abnormal condition such as the one under discussion, in a growing subject will lead to the initiation of a deformity which will get worse as growth proceeds; whilst, if the abnormality is redressed, then future growth will tend to perpetuate the cure. Hence the condition of movable or wandering testicle in its greater degrees must be regarded as abnormal and, being in a growing subject, must not be allowed to persist beyond a certain time. That it can initiate a deformity is certain, and is illustrated by some of the cases which are briefly recorded below.

This example illustrates a very common condition and is in consequence quoted first:—

1. A child, A.B., aged two years, was brought to me on account of the fact that the parents and nurse were worried because sometimes one or other testicle would disappear. On examination, it was found that the testicles easily disappeared into the groin but not into the inguinal canals. A very important distinction which the parents were unable to make. It was advised that nothing should be done, and since then I have heard that his testicles have ceased to disappear.

One must never be in a hurry to adopt special treatment in these cases. It is a very common assumption that just as we are born so do we remain throughout life. A minute's thought will show the fallacy of this. Development proceeds, perhaps in not quite so speedy and orderly a manner, after birth as before. Hence, an imperfectly descended testicle at birth may descend to the bottom of the scrotum in the course of a few months or a year.

The second case to be quoted illustrates the uncomplicated condition of movable testicle to which attention is being directed.

2. A boy, aged six years, was sent to me for a condition of imperfectly descended testicles, his doctor considering that both glands were retained in the abdomen as he had been unable to discover any traces of them. On examination no traces of them could be found and, as they could not be expressed from the inguinal canals, they were thought to be retained in the abdomen. But an important point was noticed; the external abdominal rings were large and loose, as if something was in the habit of passing through them. Later examinations were fruitless, until it was discovered that if, first of all, a finger was placed over the inguinal canal and the ascent of the testicle, on account of the cremasteric reflex excited, prevented,

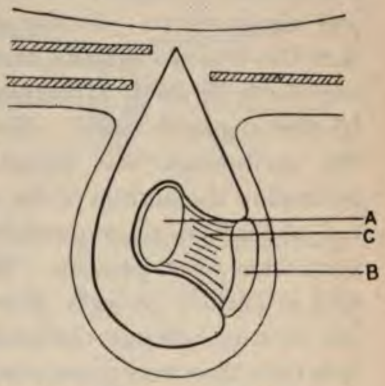


FIG. 13.—A Movable Testicle. Note the high position of the tunica vaginalis and epididymis; also the long mesorchium, *C*, which separates the epididymis, *B*, from the testis, *A*.

both organs were then discovered, and by manipulation could be made to reach the bottom of the scrotum. The boy was watched for a year; sometimes apparently he had no testicle, sometimes one, sometimes the other, and sometimes both. In consequence of the persistence of the mobility and the absence of improvement, operation was advised and consented to. At the operation, it was found that the tunica vaginalis was abnormally large and long on both sides. It extended from the scrotum to the inguinal canal. No communication with the peritoneum was found. The testicles were sutured to the bottom of the scrotum and the external abdominal rings partially closed. No hernial protrusion was present. The wounds healed by first intention. A year later the testicles were in the scrotum, though obviously a little more movable than they were three months after the operation.

The organs were of the type so frequently associated with imperfect descent and development, which will be described later (*see* p. 47).

The third case illustrates a further stage than that seen in the second with the large external abdominal rings; in this case the inguinal canals were enlarged similarly, but there was also a protrusion of extraperitoneal fat and a small hernial sac above it.

3. A boy, aged 8½, was admitted to St. Thomas' Hospital for imperfectly descended testicle on the

left side, the diagnosis being confirmed by the presence of a large abdominal ring on that side. When in the hospital the house surgeon discovered that the left testicle was in the scrotum, whilst the right was in the inguinal canal. Further observations revealed that both testicles could be found in the scrotum and could enter the inguinal canals. On account of its larger inguinal canal the left side was operated on first. A large tunica vaginalis was found which did not enter the external abdominal ring. The inguinal canal was filled with a large pad of subperitoneal fat which protruded from the external abdominal ring. Above this was a small peritoneal hernial sac. The fat and hernial sac were removed, the inguinal canal sutured and the testicle fixed in the scrotum. The wound healed by first intention.

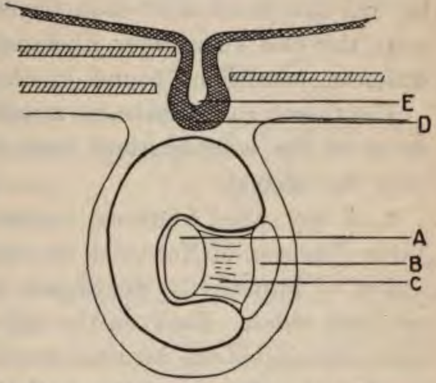


FIG. 14.—A Movable Testicle as in Fig. 13, except that the tunica vaginalis has been pushed out of the inguinal canal by a lipoma, *D*, which has pulled after it a process of peritoneum, *E*, which is, potentially at least, a hernial sac.

A Testis. *B* Epididymis. *C* Mesorchium.

The gland of the right side was sutured to the scrotum a week later.

In this case a movable testicle had led to the preternatural enlargement of the inguinal canal, through which a plug of subperitoneal fat had been forced; and subsequently, to the formation of an acquired hernial sac. It is of interest to note that he was two years older than the boy in the second case, the two years very likely accounting for the different conditions found in them.

The fourth case illustrates a still further development of the complications seen in the third case over the second.

4. A boy, aged fourteen, was sent to me by Dr. Vowe Johnson, of Norwood, on account of the condition of imperfectly developed movable testicles on both sides. That on the right side had caused much dilation of the inguinal canal and the development of a well marked acquired hernia. The right side was operated on first; the sac was removed, the canal sutured, and the testicle fixed in the scrotum. An orchidopexy was done also on the left side. Both wounds healed by first intention.

These last three cases show clearly the development of a hernia in consequence of the persistence of a movable testicle. I have seen several cases since then, and in all, except the one recorded third, the hernia has always been on the right side; a fact certainly suggestive that a right sided movable testicle is more prone to cause a hernia than the left. The movable or wandering testicle is in reality an example of the imperfect development and, frequently, of the imperfect descent of that organ. So that in these cases we are sure that there will be some deficiency of primary and secondary sexual characters, the most frequent manifestation of which is delay in the occurrence of puberty. But such individuals can propagate their kind and are eminently of the male type, the deficiency often being only noticeable in the delayed development of these characters.

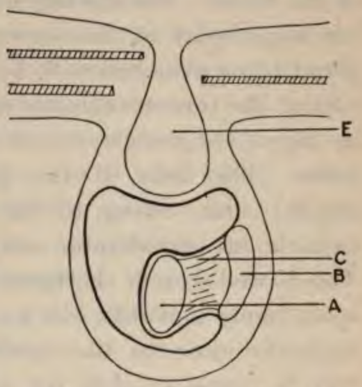


FIG. 15. — A Movable Testicle in which the complications have proceeded further than in Figs. 13 and 14. The hernial sac, *E*, has become much larger and pushed the tunica vaginalis further down. The lipoma, shown as *D* in Fig. 14, is not shown.

A Testis. *B* Epididymis.
C Mesorchium.

With regard to its pathological anatomy, the condition of mobility of the testicle is found under many variations of the typical condition about to be described and exemplified by case 2. There are two chief items to be considered: the first, with regard to the testicle; the second, with regard to the tunica vaginalis. The condition is primarily one of imperfect descent, which is shown better by the position of the epididymis than by that of the testis. The epididymis is usually delayed at the upper part of the scrotum; the body of the gland being attached to it by a long mesorchium, a fold of the tunica vaginalis which contains between its layers the vessels, nerves and lymphatics of the testis. The body of the gland is smaller than normal and, owing to the long mesorchium, is capable of considerable amplitude of movement. This is well seen in the figure (15). Not only is the testis freely movable, but by pulling on the tunica vaginalis close to the epididymis, that structure will be found to glide for some distance upon the subjacent tissues. Hence the mobility of the testicle is made up of two factors—that of the testis, and that of the epididymis. The more nearly the testicle has reached the bottom of the scrotum, the closer its anatomy approximates to the normal, and there is little or no mesorchium.

With regard to the tunica vaginalis. When the testicle is imperfectly descended it lies higher up than usual, so that its tunica vaginalis can dilate the external abdominal ring or the inguinal canal, leading to likelihood of the formation of a hernial sac. With imperfectly descended testicles the tunica vaginalis usually remains in communication with the peritoneum, so that any fluid formed in the abdominal cavity finds its way into the tunica vaginalis, forming a hydrocele. This is another factor in the dilatation of the inguinal canal. The hydrocele approximates to the type called "infantile" described in the textbooks, which consists of the patent tunica and processus vaginalis shut off from the peritoneum above (Fig. 6). If a hernia develops above this, as it very likely will, it pushes the tunica vaginalis in front of it, as in cases 3 and 4, and, at the same time, makes the testicle appear more descended than it really is. The presence of a long mesorchium is sometimes almost the only indication of its true condition of imperfect development.

To sum up, the condition of wandering or movable testicle is associated with the imperfect development and often the imperfect descent of the gland, which has a long mesorchium and a large tunica vaginalis approximating to the type in cases of infantile hydrocele, leading in some instances to the dilatation of the inguinal canal and the development of a hernia. Moreover, the cases are peculiarly prone to suffer from torsion of the cord (p. 106). With regard to treatment, the first points to be considered are the possible and probable results of leaving the cases alone. There are four important results which may occur.

1. Normal growth and development may take

place, the testicle becoming progressively more descended and less movable.

2. Owing to its movability the testicle is continually subjected to repeated movements which impede the return of blood in the veins draining it. These frequently repeated injuries produce a condition of chronic inflammation, fibrosis, in the gland, which, according to its degree of severity, will interfere with its future growth and maturation.

The gland often suffers from mild attacks of orchitis, which also will prevent its maturation and growth. Indeed, they will very likely bring about its atrophy.

3. The spermatic cord or the mesorchium are likely to undergo some degree of torsion; which torsion, according to its degree, will cause atrophy, fibrosis or cessation of growth in the gland. Clinically this torsion is indicated by attacks of pain followed by swelling, typically after some effort, sometimes very small. Attacks of pain are very important when found in imperfectly descended or movable testicles (see pp. 68–71).

4. A movable testicle, either on its own account or that of its appendages, the tunica vaginalis and epididymis, may lead to the enlargement of the external abdominal ring, the dilatation of the inguinal canal, the extrusion of subperitoneal fat, and finally, to the development of a hernia with an acquired sac. Clinically, the active progression of

such a sequence is indicated by the enlarged opening of the external abdominal ring.

When a hernia with a total congenital sac is present with a movable testicle, it may cause the condition of the gland to be overlooked. In these cases it seems probable that the condition of the testicle is the primary evil.

These four considerations indicate that at first a case of movable testicle should be watched. This period of waiting is to be limited by the occurrence of inflammation or attacks of pain in the testicle, or the enlargement of the external abdominal ring, according to their importance shown in clauses 2, 3 and 4. If they should occur, operation should be advised and undertaken. The operation is to consist of the fixation of the testicle at the bottom of the scrotum and suture of the external abdominal ring and of the inguinal canal if necessary. There are no more suitable cases for the operation of orchidopexy. The object of the operation is to prevent the occurrence of the accidents mentioned in clauses 2, 3 and 4 with their disastrous results on the future maturation and growth of the gland.

CHAPTER IV

THE IMPERFECTLY DESCENDED TESTICLE

WHEN a testicle fails to descend, it is occasionally due to the interposition of some mechanical obstruction ; but in far and away the majority of cases, it is a congenital defect which is due to some inability or lack of power of the part to develop properly. Thus, failure in the full descent of the testicle is comparable to a cleft in the palate in the development of the superior maxillae. The testicles ought to be in the scrotum in the eighth month of foetal life ; certainly, they should be fully descended at the time of birth. But development is not arrested at birth ; and if the testicles are not present then, they may appear or descend fully afterwards. Children vary much in the rate at which their physical and mental developments proceed. The presence of the testicle in the scrotum is a sign that the organ may develop and mature at puberty ; its absence, that it will not mature fully. The diagnosis of the imperfectly descended testicle is obvious if attention is paid to two points: firstly the condition of wandering or movable testis must be excluded (*see* pp. 57–61); secondly, the forefinger of the examining hand must be placed first of all directly over the inguinal canal to prevent the cremasteric reflex excited by the examination withdrawing the testicle into the inguinal region. The author has seen many instances in which neglect of the latter precaution has led to mistakes in the diagnosis. Having made the diagnosis of congenital imperfect descent of the testicle it becomes imperative to grasp the fact that just as that organ has been unable to descend at birth so will it be beyond its power to mature fully at puberty. It is similar to a baby, which has been born to grow to five feet in height, cannot grow and mature to six feet in height. To apply the knowledge of its congenital deficiency to the physiological value of the testicle, it must be remembered that the gland has at least two functions: one, as regards the race, that of producing an external secretion containing spermatozoa, the spermatogenetic function; the second, as regards the individual, that of producing an internal secretion which ministers to the maturation and perfection of the secondary sexual characters, which constitute the distinctive plumage of the male, and are apparent shortly after puberty. One fully developed and descended testicle is quite sufficient to ensure the proper production of spermatozoa and the continuity of the race, but the internal secretion of two glands is required for the full and perfect acquisition of male characters. Any deficiency will be shown at once in the development of these characters. We know from many observations that only rarely is the imperfectly descended testicle ever spermatogenetic. When it is so, the case is very possibly one of acquired imperfect descent, in which there has been some mechanical obstruction, rather than that it has been due to a congenital deficiency. But we know further that if this very rare spermatogenetic function is developed at all, it appears late, about the age of twenty years or so, and only lasts one, two or three years; then passes away for ever. This is an important fact; because if it is urgent for a man with bilateral imperfectly descended testicles to produce an heir, he must be afforded the opportunity at this age and not kept waiting till the later one usually attained at the time of marriage in these modern days.

It is found that as regards its racial function the imperfectly descended testicle is of very small account. But its internal secretion is known to be of the greatest benefit to its possessor. Study of the results of the operation of castration convinces one of this. Mr. Cuthbert Wallace has made many experiments on animals and has found that division of the vas deferens and the abolition of the function of sperm production is insufficient to prevent the development of the prostate gland and other male characters. Nothing less than castration or the non-development of the testicles will do this. Therefore, it is obvious that the practical value of an imperfectly descended testicle lies in its internal secretion. It is beyond the power of the testicle to develop as fully as does a normally situated gland and treatment must be directed towards avoiding anything which will interfere with such power of growth as it possesses. Before we pass on to consider the treatment of these cases, it is necessary to see if the developmental defect which leads to the imperfect descent of the testicle affects that gland alone. Unfortunately, this is not so. In its descent the testicle is preceded by a pouch of peritoneum, which forms later the tunica vaginalis and becomes shut off from the peritoneal cavity when the gland has reached the bottom of the scrotum. Should the gland fail to attain this situation, the closure of the peritoneal neck, the processus vaginalis, will fail also, leaving the peritoneal cavity in communication with that of the tunica vaginalis. Thus it is to be expected that every imperfectly descended testicle will be accompanied, certainly at first, by a total congenital hernial sac. But this is not always so, because development proceeds after birth, just as it does before ; and though the gland may not descend, yet the tunica vaginalis may become shut off from the peritoneal cavity. In over a hundred operations which I have performed for this condition I have found the communication open in nearly 80 per cent. This is a very important point because it means that a hernial sac, potentially so at least, is present in four-fifths of the cases.

The next point to be considered is whether it is not better to leave the testicle to develop in the position in which it is. Theoretically this may be so and it is justifiable to watch young children. But practically we find that the imperfectly descended testicle is liable to a number of accidents which will preclude the possibility of its ever attaining the full maturity of which it is capable. Of these accidents may be mentioned :—

(*a*) Injury, as in walking, jumping, etc., from the movement of the legs ; or a blow, its abnormal position preventing the gland slipping away, and thus escaping damage.

(*b*) It is more liable than the normal gland, possibly in consequence of *a*, *c* and *d*, to attacks of orchitis.

(*c*) Owing to its movements, and probably to (*d*), it is continually undergoing changes in vascularity and blood pressure, that is, in tissue tension, becoming in consequence harder and fibrotic.

(*d*) The spermatic cord is very liable to undergo subacute and chronic torsion in these cases ; the twisting being quite insufficient to produce strangulation and enough to prevent growth by causing fibrosis. The section on "Torsion of the Spermatic Cord" must be referred to for further details (pp. 106–122).

(*e*) The testicle itself or the tunica vaginalis may interfere with the proper growth of the inguinal canal, leading to its enlargement and to the subsequent development of a hernia, which will interfere with the return of the blood in the veins of the pampiniform plexus. This point is amply illustrated by the cases recorded in the section on the "Movable Testicle" (pp. 51–61 and Figs. 13, 14 and 15).

Thus from the point of view of the testicle it has every disadvantage in being left in its imperfectly descended position. After it is once certain that natural development is not merely delayed but has failed to conduct the gland to the proper place, operative treatment should be undertaken. Throughout this justifiable period of expectancy the case can be watched for the injuries in (*a*), the inflammation in (*b*) and the hardening in (*c*). The dangers of (*e*) are seen clinically in the enlargement of the external abdominal ring. But the risks of (*d*) are well worthy of full and separate consideration; and have been gathered together in a section by themselves as it is a subject which is practically peculiar to the imperfectly developed testicle (pp. 106–122).

THE SIGNIFICANCE OF PAIN IN THE IMPERFECTLY DESCENDED TESTICLE

The author first called attention to the importance of this subject in a postgraduate lecture delivered at the Hospital for Sick Children, Great Ormond Street, in 1903.[1] Further and much extended observations have confirmed the suggestions then put forward. At that date I had only done thirty operations for this condition ; now I have done 130.[2]

The symptom of pain in cases of imperfectly descended testicles is one upon which great reliance can be placed. The pain which accompanies or follows an attack of orchitis is not meant, but such as follows upon an effort, apparently coming on spontaneously, lasting from a few minutes to a few hours, and often followed by some swelling of the gland. When severe these attacks are accompanied by faintness and vomiting. The greatest factor in producing sclerosis of an organ is frequently repeated slight injuries or impediments to the venous return from it. Now, sclerosis is known to be a very frequent and progressive change in imperfectly descended testicles. It is also known to be no congenital abnormality. It must, therefore, be acquired. But how ? I believe the explanation to be found to a large extent in the pathological causation which gives significance to the clinical attacks of pain in these cases. It is very characteristic, particularly in subjects over ten years of age, to have a previous history of attacks of pain of various durations in the imperfectly descended gland. When operating, I always open the tunica vaginalis early, before the disposition of the parts has been disturbed, and note the relation of the epididymis to the testis. I have found it in almost every possible position in space: above, below, in front of, behind, internal to and external to, the testis. Further, in opening the tunica vaginalis, injury has been inflicted unwittingly on the cord and epididymis when they are in front of the testis. Whatever views are taken of the relations of the parts in these various positions, there is no doubt that some degree of torsion of the cord frequently complicates imperfect descent. It is not possible to formulate one view for the recognition of the twist, it is so very various. But one guide can be offered. The course of the vas deferens is plainly seen from the inside of the tunica vaginalis. If looked for it will commonly be found to descend on the back and inner side of the neck of the sac, descending into the upper part of the scrotum as a loop and reascending to the testicle, on its outer or front side. A distinct indication of a twist. It is very difficult to give statistics on such a knotty point of observation, but I believe a twist to be found in as many as 70 per cent. of these cases. Beyond the fact that I believe the twist to be clockwise on the left side and counter clockwise on the right, I can say nothing of the direction of this elementary torsion. Given this elementary twist, it can be increased in two ways: one, by movements of the trunk and legs ; the other, by straining efforts forcing the spermatic cord from the abdomen when it will take on a twist, screw-like, from the directions of the long and short diameters of the inguinal canal, just as the foetal head turns when descending the pelvis.[1] If the primary twist is increased sufficiently, it will cause a stab of pain ; which may be momentary or of some hours' duration, according to its degree of severity and reducibility. In certain reported cases and in one which I have recorded in this book, p. 120, pain has been relieved during the attack by untwisting the cord. These examples furnish direct proof of the torsion being responsible pathologically for the attacks of pain noticed clinically. Further, in cases which give such a history, twists of the cord are noticed. By observations made at the operation, it has been possible to correlate the pathological manifestation of torsion of the cord with the clinical picture of attacks of pain in an imperfectly descended testicle. This being so, pain becomes very important in the history of these cases and its occurrence in attacks is sufficient to warrant putting an end to the period of watching and expectancy which is the first line of treatment.

---

[1] Published in the *British Medical Journal*, June 4, 1904.

[2] March, 1907.

---

[1] In some papers, published with Dr. H. I. Pinches, on "Torsion of the Omentum," a similar view has been elaborated. *St. Thomas' Hospital Reports*, 1905, and *Transactions of the Royal Medical and Chirurgical Society*, 1906.

Before closing this section, reference must be made to cases which clinically have already been recognized. In certain examples of imperfectly descended testicle, after a period which has included several attacks of pain, the testicle has become smaller and smaller, until it has atrophied altogether; showing what is the certain fate of the glands which are left to suffer these attacks.

THE PECULIARITY OF THE TESTICLES OF CHILDREN

Active operative treatment should be undertaken in children as soon as it has become certain that the testicle will not descend of its own accord. If this is not done, the gland itself will suffer and the inguinal region, owing to the persistent presence of an abnormality, will grow abnormal and deformed. Further, after the age of ten, it has been observed clinically that a number of these cases are apt to suffer from attacks of pain in the organ. The clinical explanation for these seems to be that there is some torsion of the cord. Therefore, the age of selection for operation is between five and ten, or even as early as three years. But as the peculiarities of the testicles at that age are important and unappreciated, they must be presented in detail. A baby's testicle differs from an adult's in its capability to grow and mature at the age of puberty. Therefore, in their reaction to stimuli or disease, we must look for the difference in the same peculiarity. The result can be summed up as follows : the earlier in life and the more severe the occurrence of inflammation or fibrosis of the testicle, the greater the likelihood that the organ will never be able to mature. Therefore, any of the accidents mentioned—pain, acute inflammation, chronic inflammation, torsion of the cord or the development of a hernia—may kill the organ and physiologically, though not anatomically, castrate the boy. Further, when performing an operation upon the inguinal region of children, the greatest care must be exercised to avoid inflicting any injury on the constituents of the spermatic cord, as subsequently they will cause some degree of inflammation in the testicle and its imperfect maturation, if not to its atrophy.

The performance of the operation of radical cure of inguinal herniae in children becomes doubly important because of the possibility of affecting the testicle as well as the hernia. It is poor recompense to give the child a radical cure for its hernia and at the same time physiologically remove its testicle. Therefore, I may be pardoned if I digress a little and make a few practical observations on the performance of this operation.

HERNIA OPERATIONS IN CHILDREN

The operation for the radical cure of a hernia should be performed whenever possible about the ages of three to five. As I advocate the operation at this age, it is imperative that I should indicate points to which attention must be given in order to avoid inflicting damage on the testicle.

Firstly, when possible, it is best to defer operation to this age as then the anatomical parts are well enough developed to enable the surgeon to avoid injuring important structures. *Secondly*, the inguinal canal should be opened as the spermatic cord is more easily separated from the hernial sac in this situation, than in the neighbourhood of the external abdominal ring. *Thirdly*, the separation of the cord from the sac should be done for the distance of about half an inch, and no more, with two pairs of dissecting forceps, not with the knife. *Fourthly*, after doing this, and not before, the sac should be opened and cut across to divide it. In some cases it is necessary to combine the two steps in "thirdly" and "fourthly." *Fifthly*, the neck of the sac should be ligatured as high as possible and the redundant portion removed. The distal part of the sac should not be removed and no more than necessary stripped from the cord in order to minimize the risks of injuring the spermatic and deferential veins and of causing post-operative thrombosis in them. This is indicated by oedema of the scrotum, hardening and enlargement of the testicle ; two things to be avoided. *Sixthly*, the inguinal canal is sutured and the radical cure is completed. *Seventhly*, healing must take place by first intention.

In advocating the non-removal of the fundus of the hernial sac one exposes the patient to a slight risk of the formation of a subsequent hydrocele or haematocele within it. All I can say is that personally I have experienced no such trouble and that, should it occur, the consequences are of infinitely less importance than are those which follow *post-operative enlargement and hardening of the testicle* ; for, according to the degree of that fibrosis, the gland will not develop.

The operation of radical cure for the hernia of children has become quite distinct from that of adults and requires much more care, skill and patience in its performance. A real and irreparable harm can easily be done to the child.

THE RELATION OF IMPERFECTLY DESCENDED TESTICLES TO HERNIAE

It has been stated that a communication was found between the tunica vaginalis and the peritoneal cavity in 80 per cent. of the cases operated on by the author. Apparently there was not a true hernia in every case; though if there had been any fluid in the peritoneal cavity there would have been a hydrocele in a possible hernial sac in every such case. Most often the imperfectly descended testicle is associated with an inguinal hernia which has a total congenital sac, i.e. communicating with the tunica vaginalis (Fig. 5). Next frequently, it is associated with an inguinal hernial sac which does not communicate with the tunica vaginalis; personally, I regard this, in most cases, as an acquired sac. Besides this, the imperfectly descended testicle is often associated with interstitial and bilocular sacs; in the latter cases, the upper loculus is the interstitial one. Of this interstitial kind several varieties exist, according to which structures the sac lies between. First of all, the sac may lie between the peritoneum and the abdominal muscles, the properitoneal type: of which there are two subvarieties, the prevesical, in front of the bladder; and the iliac, when the hernia is in the iliac fossa. Next are the intermuscular forms of which there are three subvarieties; if the sac is between the internal oblique and the transversalis, between the internal and external oblique, or between the external oblique and the conjoined tendon. Of these three, the last is the rarest. The most common form of interstitial hernia to be associated with an imperfectly descended testicle is when the sac lies between the external oblique and the skin, to the outer side of the external abdominal ring and over the inguinal canal (Fig. 9).

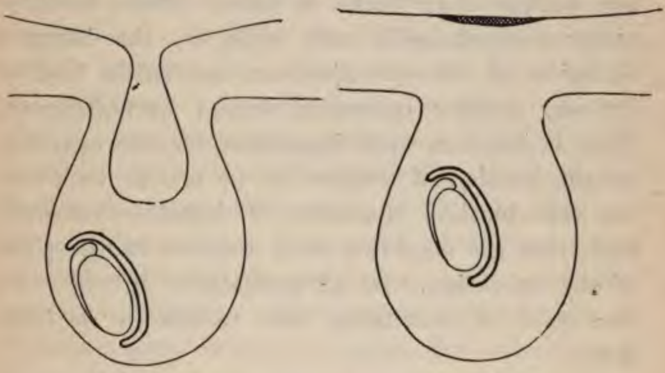
When the hernial sac is bilocular, one of the chambers is almost always in the scrotum and the other occupies one of the situations mentioned in the description of the interstitial herniae. Most frequently the second chamber of the sac lies between the skin and the external oblique tendon, external to the external abdominal ring.

Very rarely an imperfectly descended testicle is associated with a femoral hernia or a perineal hernia.

The important points with regard to these herniae are two: firstly, the very great frequence of the presence of a total congenital sac, which is potentially so if not actually hernial; secondly, an imperfectly descended testicle can interfere with the natural healthy growth of the inguinal canal, leading to its enlargement and to the development of a subperitoneal lipoma and, above it, a hernia with an acquired sac (see Figs. 13, 14 and 15). Both points indicate that careful clinical observations must be made from time to time if it is decided to watch the case. Otherwise damage may be done, which is recognized late instead of early, and which could have been prevented in the greater part.

MASKED IMPERFECT DESCENT OF THE TESTICLE

Imperfectly descended testicles have another and very important relation to herniae, which is the more noteworthy as it has not been recognized. When accompanied by a hernia, the testicle gets pushed further and further down the scrotum when the hernia "comes down." In fact, it can reach the bottom of the scrotum and appear to be fully descended. It remains in this position so long as the hernia is untreated. If a truss is worn, it can be observed that the testicle rises a little, but it would require very much more than



I. II.

FIG. 16.

I. The hernia has pushed the testicle, with its tunica vaginalis, to the bottom of the scrotum.

II. The hernia has been removed by operation, in consequence of which the testicle, with its tunica vaginalis, has risen to the position of imperfect descent, occupied by it previous to the development of the hernia.

the observations of ordinary patients to notice this. If the hernia is operated on and the sac either divided and ligatured or removed, it will be found that the testicle ascends to an obvious position of incomplete descent. This observation is often made at the time that the stitches are removed; the patient may make it later. These testicles rarely descend again and, owing to the internal cicatrices of the operation, are not easily treated by any further operation except orchidectomy. Thus it becomes very important for the operator on the herniae of children to be on the look out for this masked condition of imperfect descent and treat the condition as it requires at the time of the operation. In all probability it will save the need of sacrificing the testicle at a later date.

Looked at from another point of view, the inguinal herniae of children often result from some congenital defect and, therefore, it would not be surprising to find a similar condition in so closely related a part as the testicle. Whenever there is any suspicion of a hernia being of congenital origin, it is wise of the operator to ascertain the condition of the testicle. This should be the habit with those who regard all the herniae of children as congenital. The masked condition of the testicle may be considered as one of apparent secondary or acquired imperfect descent of the gland.

THE RELATION OF IMPERFECT DESCENT TO THE INCIDENCE OF MALIGNANT DISEASE

It has long been taught that when imperfectly descended, and particularly when abdominal, testicles are more prone than usual to suffer from malignant disease. If the evidence for this is examined dispassionately, it will be found to be inconclusive. Further, the imperfectly descended testicle presents two points which might affect this incidence: namely, the imperfect descent and a developmental deficiency. The evidence upon which the reputed relationship of malignant disease to imperfect descent is based is insufficient. But one knows from other parts of the body that congenital defects are not infrequently associated with the incidence of malignant disease. Hence, it seems more correct to regard the proclivity of these cases to suffer from malignant disease on account of the developmental deficiency rather than the situation of the testicle. This is important because the operations of orchidopexy, the scrotal fixation of the testicle, and of orchidocoelioplasty, its abdominal reposition, by changing the position of the gland might exert an influence on its future prospects of disease. But if the congenital deficiency of the gland is regarded as the disposing factor and not its position, this is not so, its liability being as great wherever it may happen to be.

CHAPTER V

PART I

THE TESTICLE: ITS RELATION TO ITS BLOOD SUPPLY, ITS DUCT, AND INFLAMMATION

BEFORE considering the individual operations it is necessary to discuss three points: firstly, the influence of interference with blood supply upon the gland; secondly, the influence of division of the vas deferens upon the gland; and thirdly, the influence of inflammation. Further, all three will be treated in two sections, according as the lesions occur in the child or in the adult.

THE TESTICLE AND ITS BLOOD SUPPLY

A. **In the child.**—As operation for the condition of inguinal hernia and imperfectly descended testicle has been recommended at an age when that gland has not yet developed, it becomes a question of the greatest importance that the practitioner and surgeon should inquire if the mature and immature organs react differently to interferences with their blood supply. That they do so react is a clinical observation very easily made. Moreover the difference is one of vital importance to the testicle and its possessor. The immature organ reacts in this way. Any injury to the blood supply of a growing immature testicle will interfere with the future growth and maturation of the gland; the greater the vascular injury, the greater will be the interference with the growth and maturation of the testicle. In fact, the gland may cease to grow at all and subsequently atrophy.

B. **In the adult.**—Surgeons have their greatest opportunity of studying this question in the results of the operation for varicocele, to which chapter the reader must be referred for details (pp. 202–209). In this place, it may merely be stated that a slight vascular injury produces an appreciable effect upon the adult testicle. After varicocele operations, it was found that in 90 per cent. the gland was definitely sclerosed, in 53 per cent. it was larger and 21 per cent. smaller than the gland on the opposite side. In the face of such gross changes in the adult testicle, it becomes easy to understand that even slight vascular injuries prevent or affect the growth of such a delicate organ as the immature gland.

The phrase "interference with the blood supply" is a vague one in the sense that the blood supply consists of two main factors which respectively carry the blood to and from the part. Our knowledge of the results of interference with one of the factors alone is not great. The author in per forming the operation for varicocele has removed the veins and left the spermatic artery free. But from the few cases in which this has been deliberately done it appeared to be rather a disadvantage than otherwise. Because by leaving the artery intact and removing the veins, it seemed that the patient had greater difficulty in the establishment of an adequate anastomotic circulation than if the artery had been removed along with the veins, as it is in the ordinary operation for varicocele. Indeed, it seemed as if the signs of venous obstruction, oedema of scrotum, etc., were more marked. This practice of leaving the spermatic artery intact has been far more extensively pursued by other surgeons, but there is no evidence in hand that their results are in any way better than the ordinary ones.

We have practically no knowledge of the testicular results of ligature of the spermatic artery. Whilst this is true for man, it is not so for animals. We know, for instance in dogs, that ligature of the spermatic artery is soon followed by fatty degeneration of the epithelial cells of the gland for both secretions. Considering these effects and those known to result from interruption of the venous return, what a massacre must be done on the testicular tissues by the operation for varicocele in young subjects!

THE TESTICLE AND THE VAS DEFERENS

The vas deferens is rarely divided by an injury, but it is occasionally at operations; and still more frequently is it physiologically divided by a pathological lesion such as a fibrous nodule, chronic epididymitis, though anatomically it remains continuous.

A. **In a child.**—In a child uncomplicated division of the vas deferens interferes but little with the growth of the testicle. As usual the gland will begin to develop an external secretion at puberty when fluid secreted by the prostate and vesiculae will be ejaculated which will contain no spermatozoa on account of the division of the vas.[1] The testicle at first secretes spermatozoa, but gives up doing so after a period of very various length. Sometimes a spermatocele is formed as a kind of retention cyst. The spermatogenous cells then atrophy; leaving an organ, the tubuli of which are merely lined with cubical cells. Thus division of the vas, vasotomy, interferes very little if at all with the maturation of the gland up to puberty. At that date, the organ attempts to develop its external secretion and fails; but the internal secretion is active. Mr.

---

[1] Presuming the lesion to be bilateral.

Cuthbert Wallace showed that vasotomy in the young did not interfere with the growth of the prostate gland, though castration did so; conclusively demonstrating that though it stopped the external secretion, the internal was active. The activity of the internal secretion of an animal, whose vasa deferentia have been divided, is shown by its full development of the secondary sexual characteristics; a great contrast to the sexless appearances of the castrated animal.

B. **In the adult.**—Division of the vas deferens in the adult stops the excretion and soon the secretion of spermatozoa; it may lead to the formation of a spermatocele, and will be followed by the gradual atrophy of the spermatogenetic cells. The testicle itself does not alter much in size; occasionally it becomes at first a little larger and later a little smaller. Apparently the change is one of fatty degeneration in the cells.

In the above paragraphs, the phrase division of the vas deferens has been used to mean complete interruption of its channel. But an injury to the duct is not necessarily followed by its permanent solution of continuity. Incomplete division is not meant; but the ends of the divided vas can unite in such a way as to restore the channel. Two or three stitches will complete the end to end (circular) anastomosis, vasorrhaphy. It is not advisable to use some unabsorbable material to maintain the lumen such as by leaving a horse hair in the duct; if anything is used, it should be catgut or similar material. But the author would prefer to use neither, relying on obtaining union by first intention. If such union is not obtained there can be no hope of restoring the physiological and anatomical continuity of the duct. That the operation of vasorrhaphy is of physiological value is shown by the following case. In the performance of a difficult operation for inguinal hernia, the large intestine which was only partially covered with peritoneum forming part of the wall of the sac, the vas deferens was divided. The testicle of the opposite side was the size of a small marble, having atrophied after orchitis consequent on mumps. Therefore, the misadventure to the vas meant sterility to the man. The cut ends of the vas deferens were approximated by two or three stitches of fine silk (a circular vasorrhaphy) and the operation completed. Union took place by first intention. Since the date of the operation the man has married and his wife has already presented him with a son. Of course, it is impossible to deny the possibility of a small focus of spermatogenetic tissue being present in the atrophic testicle. But it is very improbable. Neither is there any shadow of reason to doubt the paternity of the child. The success of this operation makes it appear possible to do something for cases of sterility due to fibrous nodules in the cauda epididymis or the vas deferens, the results of chronic epididymis or of injury.

THE TESTICLE AND INFLAMMATION

There is yet to be considered the influence of inflammation upon the testicles of the child and the adult. It must be remembered that the former suffers from orchitis and the latter most frequently from epididymitis.

A. **In the child.**—If a child gets an attack of orchitis, such as it may as the consequence of a specific fever, such as mumps, or an injury; according to the degree of its severity, in corresponding degree will it prevent the testicle from maturing or even lead to its atrophy. Thus post-operative inflammation of the gland, such as after the radical cure of a hernia, becomes of paramount importance; and practically so, if there is any reason to suspect any inefficiency of the gland of the opposite side. It must be added that prolonged subacute, i.e. chronic inflammations, do more harm than do transient acute inflammation.

B. **In an adult.**—Orchitis, according to its chronicity, produces sclerosis of the adult testicle. But it does not affect the secretion of spermatozoa very much; and as the secondary sexual characters of the male are already fully developed, it does little permanent harm. But the orchitis of an adult is generally complicated with epididymitis, and it is in this complication that the physiological effect is found. According to its degree of severity and chronicity, this epididymitis leaves behind it scar tissue which may contract and cause stenosis and pathological division of the duct. This will be followed by the gradual atrophy of the spermatogenous cells of the gland and the sterility will be rendered permanent.

Part II

THE OPERATIONS FOR IMPERFECTLY DESCENDED TESTICLES

The question of the advisability of operation under certain conditions in cases of imperfectly descended testicles has been fully discussed (pp. 66–72). But the question of the condition when unilateral or bilateral has not been considered in this connexion. A boy with an unilateral imperfectly descended testicle is in this condition; he has an external secretion and can become a parent, but he is deficient in the internal secretion and will not develop full male secondary sexual characters. With bilateral imperfectly descended testicles, a boy has only the faintest chance of becoming a father, and he will have marked deficiencies in his secondary male characters.

ORCHIDOPEXY OR ORCHIDORRHAPHY

The most perfect operation for the condition of imperfectly descended testicle is that of fixing the gland to the bottom of the scrotum. This operation by placing the gland in its proper anatomical position gives the most satisfaction to the patient. Unfortunately it is an operation which has a large number of restrictions, rendering it a failure or a very imperfect success in a larger number of the cases. Yet its popularity is such that in spite of the failures, it is the object at which surgeons strive. Results show that between the ages of five and thirteen there is three times as much chance of success as there is later in life. A recent estimate for perfect success was about 30 per cent. for this period, and about 10 per cent. later. It is not to the credit of those who practise surgery that such a state of affairs should be allowed to exist any longer, and the first thing to be done is to institute an inquiry into the causes of non-success.

In the first place, though imperfectly descended testicles are sutured into the scrotum and may remain there, they have not the necessary congenital capital to develop fully; they must always remain small. It is as much beyond their power to develop as it would be for a pound of gunpowder to blow up a battleship. Secondly, in order to bring the testicle down, the cord must be freed; a proceeding not without danger to the vessels, injury to which means the non-development of the gland. Thirdly, a cord which has been freed in this manner must cicatrize and will very likely draw the gland upwards again. Fourthly, though the vessels are not directly severed at the operation, they are stretched so tightly as to impede the return of the blood within them. And further, such injuries may have been inflicted on their parieties as to lead to postoperative thrombosis. Fifthly, as the result of the operative measures of the impeded vascular return, the sutured testicle is very prone to suffer some subacute or chronic orchitis. The list of evil consequences could be continued, but enough has been said to show that the testicle in orchidopexy has to run the gauntlet of a long series of dangers, each of which, wholly or in part, is capable of causing the non-development or even the atrophy of the gland. In fact, it has been stated that "in every case in which the organ appeared normal at the time of operation, there has been subsequent diminution in its size." Therefore, it is obviously worse than useless to attempt to perform orchidopexy unless the testicle can be brought down with ease, requiring but little freeing of the cord. The last remark is important, because the testicle is often drawn up after orchidopexy close by the pubic spine, becoming the seat of much pain and tenderness. Hence the troubles of failure of the operation need not be confined to the disasters to the gland itself, which have been enumerated above. But besides the examples of imperfectly descended testicle in which the organ can be brought easily into the scrotum, orchidopexy is much more useful in treating such cases as I have described elsewhere as movable or wandering testicles (pp. 51–61). They would seem to be the very ones for this operation.

There is no doubt that in order to save the credit of surgery it is necessary to restrict the field for the performance of orchidopexy very much. It is an operation which can do much harm and, in consequence, should only be done in very carefully selected cases.

ORCHIDECTOMY

This operation has a distinct place in the operative treatment of imperfectly descended testicle. The organs have a possible useful external secretion about the ages of twenty to twenty-three, and are of value for the acquisition of male characters through their internal secretion. But when these secondary characters are once developed, they remain so. Hence after the age of twenty-three or thereabouts, if an imperfect descended testicle requires operation, there need be no scruple in its removal, its period of usefulness being over. Up to this age or thereabouts it is wrong, unless there are special indications, to remove the testicle because of robbing the individual of the certainty of some benefit from its internal secretion as well as of the uncertain possibility of an external secretion. If such testicles are left alone, in all probability they become more or less useless through fibrosis. Therefore they should be returned to the abdomen, orchidocoelioplasty.

Orchidectomy should be the operation in men over twenty-three for fibrous and atrophic testicles which cannot grow, and whenever there is any question of disease, or there is chronic torsion of the cord or any other special reason to indicate it. Finally, it may be mentioned that orchidectomy is the measure to be adopted after surgical or natural failures in the gland, except in the instances mentioned. It is the surgeon's last resort.

ORCHIDOCOELIOPLASTY

Orchidocoelioplasty is the name which I have suggested for the operations which have for their object the return of the testicle to the abdomen. The advantage of this procedure is that the gland is out of harm's way; just as is the ovary in the abdomen of the female. We know that it continues to develop, though of course not as much as a normal gland, which is beyond its power; and, further, it developes along the lines of an internal rather than of an external secretion. But even an external secretion is possible, for we know of undoubted cases of the paternity of double cryptorchids. Such a phase can be of very short duration, because it is known that if normal testicles are replaced in the abdomen, in the course of time they lose their spermatogenous cells. There is little doubt that abdominal testicles have some value for the economy of the organism. Cryptorchids develop considerable degrees of male secondary characters and have even, if very rarely, become parents. Therefore up to the age of twenty-three or thereabouts, when operating on imperfectly descended testicles, it is best, if the gland cannot be brought easily to the bottom of the scrotum and presents no special features, such as have been mentioned and demand excision, it should be returned to the abdomen. It is an old tale that abdominal testicles are more prone to suffer from malignant disease than are the extra-abdominal glands. There is no evidence that it is the abdominal position which causes this proclivity. It would appear that the true explanation must be sought in the fact that the organ is congenitally deficient; we know that developmental defects offer opportunities for the incidence of malignant disease. Orchitis in an abdominal testicle is a rare event. After a skilfully performed orchidocoelioplasty it should be very rare. There are two main methods of performing of this operation, the intraperitoneal and the extraperitoneal; the former of which is to be preferred, though it must be acknowledged upon theoretical rather than practical grounds.

Two objections have been urged to this operation besides the one mentioned above: firstly, that the gland becomes functionless; and secondly, that it may escape into the inguinal canal again. The former of these we know to be untrue; the abdominal testicle has an internal secretion. The latter is due to an error in the technique, and is rather the fault of the operator than of the operation.

THE ACQUIRED IMPERFECTLY DESCENDED TESTICLE

Imperfect descent of the testicle is usually looked upon as the result of some congenital deficiency. But it is a condition which can be acquired. It can be acquired as the result of some obstruction to the descent in the late foetal life. It is rare for such a case to be recognized. It can occur after thrombosis and cellulitis of the spermatic cord from cicatricial contraction. In such cases the gland sometimes descends again; and sometimes it remains in the higher position, getting a little smaller and harder. Most frequently it is the result of an operation for the radical cure of a hernia; previous to that operation the gland being at the bottom of the scrotum. There are three ways in which the acquired imperfect descent may be brought about. In the *first*, the testicle was originally imperfectly descended, but owing to the propulsion of a hernia behind it, the organ assumed a lower or more descended position, that of masked imperfect descent (pp. 77–78). It therefore appears to be fully descended. When at the operation the hernial sac has been freed, ligatured, and divided, the testicle is apt to resume its original position, reproducing its imperfect descent. *Secondly*, if the hernial sac is not sufficiently freed from the cord when the sac, after being ligatured, has been reduced into the abdomen, it will pull the testicle up into a higher position. *Thirdly*, in bandaging up a case after an operation, as for instance the radical cure of a hernia, the organ may become adherent to the scar of the operation. By this is meant the internal rather than the external cicatrix. I do not believe that this last is anything like so frequent as the two former factors in the causation. Similarly, the second factor can be excluded in the hands of competent surgeons. And one is led to look upon the first cause, original imperfect descent, as the most important: and also to a very general conclusion, namely, we recognize that imperfect descent of the testicle is frequently accompanied by a hernia; and now we may recognize that a hernia may be accompanied by an imperfectly descended testicle, especially so in children and when the sac is a total congenital one. A further generalization may be made. The proper closure of the processus vaginalis, which leads to the congenital discontinuity or separation of the tunica vaginalis and the peritoneum, is dependent, wholly or in part, on the perfect descent of the testicle, and the failure of this proceeding very likely represents one of the earliest and smallest in a series of developmental defects, of which a more severe form is recognized as an imperfectly descended testicle. The presence of a congenital sac should always place the surgeon on his guard for the presence of a testicular anomaly. The imperfect descent of the testicle is merely an obvious example in a series of developmental errors.

A great deal of harm may result to the individual from this oversight on the surgeon's part, on account of the subsequent imperfect maturation of the gland, which becomes exposed to all the changes which result from its position. The condition should be recognized and treated *secundum artem* at the first operation, and it is merely necessary that attention should be called to it for this to be done. Clinical experience emphasizes this point. The consequent healing of the wound with matting of the cord may lead to interference with the blood supply and to the impoverishment of the nutrition of the gland. The same process brings about a more or less complete fixation of it, so that later operations for transplanting the organ to the scrotum or the abdomen cannot be carried out, and one is left with the choice of protecting or excising the gland. Recurrent attacks of pain and orchitis usually precipitate the latter procedure. Or the organ wastes and becomes practically a mass of fibrous tissue.

SUMMARY OF TREATMENT

Nonoperative

1. A baby with imperfectly descended testicle or testicles should be watched to see if further development is going to take place. This period of expectation can be continued so long as: (*a*) attacks of pain; (*b*) inflammation in the gland (orchitis); (*c*) hardening in the gland, or (*d*) dilatation of the inguinal canal or the development of a hernia, do not occur.

Operative

2. No operation may be called for in mild cases when the testicles are close to the bottom of the scrotum, or when they are abdominally retained.

3. Operative interference is demanded in most cases on account of the secondary changes of an inflammatory and sclerotic nature in the gland to which the position of imperfect descent leads. Again, there is the frequent coexistence of a hernia with this condition. And in these cases where it does not often or has never previously come down, the narrow opening or neck of the sac may cause one of the most dangerous varieties of strangulation to which a hernia is liable.

4. Orchidopexy is only applicable in mild cases of imperfectly descended testicle, such as the movable testicle.

5. Orchidectomy is only justifiable under special

pathological conditions; for example, torsion, severe neuralgia, extreme atrophy and so forth, and in the older cases; that is, after the occurrence of puberty and when a possible and problematical period of testicular activity and spermatogenesis has passed, say from twenty-three upwards.

6. Replacement in the abdomen, or orchidocoelioplasty, is indicated in far the majority of cases, and should be always done before puberty and up to the age of twenty or thereabouts.

CHAPTER VI

ATROPHY AND HYPERTROPHY OF THE TESTICLE

Atrophy.—Atrophy of both testicles is an uncommon event; atrophy of one gland is quite frequent. The atrophy usually follows an attack of acute inflammation in the testis of a boy or young adult. The usual source of the inflammation is a specific fever, particularly mumps or parotitis. Both testicles can be affected, but it is very uncommon for them to be. There is another source of atrophy of the growing gland, namely, an injury to its blood supply. This is usually the result of an injury to the groin or of an operation in which some damage was of necessity, or otherwise, done to the vessels, which demanded their ligature or resulted in their postoperative thrombosis. The vessels injured are almost always the veins of the pampiniform plexus, such as are removed in the operation for varicocele. It is the fibrosis consequent on the venous congestion which inhibits the gland from maturing or causes its atrophy. After an operation for varicocele, Mr. Nitch and I found the testicle enlarged in 56 per cent. But it was enlarged by the formation of fibrous tissue which later contracted and killed the glandular tissues. Thus, though the glands were larger, physiologically they were atrophic.

It has been shown in the proper section (pp. 194–209) that the removal of the pampiniform plexus in the operation for varicocele exaggerates and hastens the occurrence of those very changes in the testicle which the varicocele would itself have induced in the course of years. Markedly atrophic, and occasionally painful neuralgic, testicles are found only with large varicoceles of long standing. The practitioner will appreciate that the phrase atrophic testicle is applied in a physiological sense to an organ which has lost, wholly or in part, its glandular tissue. At the same time, and in an anatomical sense, it may even be enlarged.

With regard to treatment, little can be done in the way of cure or of delaying the progress of the atrophic process. The younger the subject, the worse the prognosis. However, something can be done to delay or arrest the process. Continence, sexual rest, must be insisted on ; bad habits, mental and physical, must be corrected. Internally, tonics may be given, or an enterprising practitioner may attempt to supply the lacking secretions in the young by means of some organotherapy, such as the administration of such substances as lamb's fry, orchitic extract, spermin, didymin, etc. Externally, counter-irritants such as tincture of iodine or the stronger liniment of iodine, turpentine, etc., may be used to promote the absorption of inflammatory products. These are usually all that it is wise to apply in the young. Adults respond best to the repetition of a series of small blisters, the emplastrum litis being applied to the skin of the scrotum over selected spots. If the testicle becomes painful and will not yield to treatment it will probably require removal. Besides the atrophic testicle, there is a still greater class of cases in which there is not so much atrophy as imperfect development.

Thus, in the out-patient department of a large hospital it is easy to note the greatest variations in the sizes of the glands. It is by no means uncommon to find small and poorly developed glands in a big burly man ; while in a little skinny one they are relatively very large. The problem of the cause of this great variety is of interest. In some cases, particularly those in whom the secondary sexual characters are deficient, the condition may be a congenital one, the result of lack of developmental power or capital. In many instances, I am sure that it is acquired ; and for two reasons : one, it may be the result of some inflammation, injury to or deficiency in the blood supply, interfering with the proper growth and maturation of the gland; two, the result of sexual stimulation, such as from bad habits, before the glands are mature and prepared to perform their proper functions. Thus I would place sexual excitement and gratification before or shortly after puberty in a very different category to its practice later in life.

Hypertrophy.—Hypertrophy of the testicle is very much rarer than is atrophy or as is popularly supposed. The obvious enlargement of the organ does not represent a true increase of its glandular tissues. Thus a large gland is often of less physiological value than one of ordinary size. It is more than doubtful if the loss of a testicle in an adult is ever compensated by true glandular hypertrophy of the organ of the other side. Before puberty, it seems more likely that such an hypertrophy of the tissues of the immature growing gland is possible. But even this is by no means proved. To go further; the prenatal loss of one testicle has not been shown to be followed by true hypertrophy of the other gland. There is no treatment given for hypertrophy. But insidious enlargement of the gland must always raise suspicions of disease in the mind of the practitioner. Iodide of potassium and perchloride of mercury internally, with mercurial ointments externally, will help in the absorption of products of inflammation; perhaps saving the gland from future atrophy. A clinical point worthy of notice is the presence or not of a hydrocele. If present, it indicates the process is not pure hypertrophy but of an inflammatory nature.

INJURIES OF THE TESTICLE

Traumatic lesions of the testicle are rare, doubtless owing to the great mobility of the gland. They may be punctured, incised or lacerated wounds, or contusions.

Punctured Wounds are almost always of surgical origin; the most frequent cause being the trocar in tapping a hydrocele. When the gland is stabbed, the patient suffers acute pain and may faint. On withdrawing the canula from the tunica albuginea, the fluid of the hydrocele is bloodstained. In the majority of cases no harm results. In others a varying degree of orchitis follows; sometimes it is trifling, sometimes it is great. A haematocele may form in the tunica vaginalis if the bleeding continues. A haematoma may form under the tunica albuginea, which may become an encapsulated haematocele or cyst by the processes of inflammation round it. Further, the organization of the coagulum within it has led to the suspicion of the presence of intracystic growth, such as in duct carcinoma of the breast.

If septic organisms are introduced, suppurative complications, such as abscess or gangrene of the testicle, may ensue.

Incised Wounds are very rare, unless made purposely as by a school of surgeons in the treatment of orchitis. The edges of the incision in the tunica albuginea gape, the subjacent tunica vasculosa bleeds, the deeper lying seminal tubules may protrude. Unless the gland is already diseased, as by tuberculosis, hernia testis does not occur. The wounds heal well and rarely become septic.

Contused Wounds are of far more serious prognosis than are punctured or incised wounds, on account of the more extensive injuries to the surrounding structures and the additional likelihood of the incidence of suppurative processes. The affected glands very commonly atrophy. Hence if the injury warrants it, there need be no hesitation in removing the gland, primary castration.

Contusion.—The usually accepted ideas of contusion of the testicle consist of dividing them into three degrees : the *first*, with injury to the capillaries and not to the tubules ; the *second*, with injury to both vessels and tubules so that the gland can only in part recover ; the *third*, with complete destruction of the glandular and vascular tissues, converting the testicle into a mass of bloody pulp. In the third degree the tunica albuginea is often ruptured, whilst in the first two it remains intact. This classification is of little use clinically, only enabling the cases to be catalogued *after* their progress has been watched, and not before. If the tunica albuginea is ruptured, a vaginal haematocele will be formed; if it is not, a testicular haematocele will result. In neither case will the gland recover, though there need be no sloughing.

The injury is followed immediately by acute and agonizing pain in the testicle and abdomen; occasionally it is referred down the thighs. The sufferer may faint and vomit; though he will do neither so frequently as he feels he will. Instantaneous death is a rare but well-known result. The initial pain disappears more or less quickly, and in slight cases may be followed by no evil result. But if orchitis sets in, on the second or third day, it is often followed by atrophy of the injured gland. The atrophy in these cases is usually quick, the process being ended in six to eight weeks.

Treatment.—Punctured or incised wounds and contusions are treated at first by rest in bed, the testicles being supported, cold applications or sterilized dressings. Contusions and incised wounds speedily heal. A puncture may give rise to testicular or vaginal haematocele, which may need incision. Should either result from a contusion it may require incision. Indeed, early swelling of the gland after severe contusion may require incision of the tunica albuginea to relieve the intra-testicular pressure and to save the gland from atrophy. Contused lacerated wounds are different. If the testicle is badly injured or engrimed with dirt, it had better be removed at once. In fact, atrophy so commonly follows the more severe injuries that there need be no hesitation in doing this. The scrotum hardly ever sloughs.

CHAPTER VII

TORSION OF THE TESTICLE

TORSION of the testicle has always been regarded as a condition which derives its main interest from its rarity. In the earlier days cases were rarely reported, and then only one at a time. Nowadays far more cases are reported and each author reports a number. Are we to infer that a rare disease has become much frequent ? Or, is it that fewer cases are overlooked and more are recognized ? There is no doubt that the latter is the correct explanation. Further study of the modern cases shows for what they can be mistaken, and, if the older literature is examined in the light of this knowledge, cases will be discovered recorded under such diagnoses as haemorrhagic infraction of the testicle, acute thrombosis of the vessels of the spermatic cord, spontaneous necrosis of the testicle, gangrene of the testicle after haematocele, orchitis in misplaced testicles, acute hydrocele, etc. Time after time the industry of the various authors has resulted in the collection and recollection of previously reported cases until their papers contain little more than repetitions of what has been said already by others. Whenever a literature has reached such a state it becomes imperative for some one to examine and digest this mass of work from a clinical and a pathological point of view. This attempt was begun by me in 1901, and has been continued as new works have been published. Five cases of acute and many of subacute torsion have passed under my own observation. Suffice it to say that fully one hundred cases are now published, and that both clinically and pathologically these present many and various pictures: so much so, that we must recognize cases of acute torsion, subacute torsion, and chronic torsion of the testicle; a great advance on our previous knowledge. First, a few statistics are given from these cases.

The youngest case was found in a baby fourteen days old, and the oldest is rather a doubtful case between seventy-five and eighty years of age. 20 per cent. of the cases occurred within the first decade of life, 47 per cent. during the second decade of life, 20 per cent. in the third decade of life, 10 per cent. in the fourth decade, 2 per cent. in the fifth decade and 1 per cent. later. The figures show very clearly that the majority of the cases occur about or shortly after the changes in the testicle and spermatic cord which take place at puberty. Therefore these changes are factors in its production.

The testicle on the right side suffered more frequently than the left in the proportion of about 3 : 2, the relative percentages being about 60 and 40. No case of simultaneous bilateral torsion has been recorded. In about 66 per cent. (two-thirds of the cases), the gland was definitely imperfectly descended. In the remainder, 34 per cent., it is either definitely stated or implied to have been fully descended. These figures are in fact of little value, because, from study of the descriptions of the 34 per cent. in which the testicle is said or implied to have been fully descended, it is obvious that some developmental defects such as a long mesorchium, great mobility, etc., were present. So that an examination of the available examples makes it certain that some developmental defect is present in a much greater proportion than the figure 66 per cent. represents. This defect need not be obvious imperfect descent. In fact, torsion of the testicle would seem to be rare apart from such a deficiency. Turning to the pathology, it is certain that the examples have as complex and various a pathology as they present clinical pictures. It would seem that first of all they must be divided into two classes : (*a*) when the torsion is in the spermatic cord just above the epididymis, and (*b*) when the torsion occurs in the mesorchium, between the testis and the epididymis. The fact that many authors have not recognized this distinction has caused much confusion, and rendered the elucidation of certain points difficult or impossible. These two structures are sometimes twisted at the same time. For purposes of clearness each will be considered separately.

Torsion of the Spermatic Cord.—In these cases the torsion begins in the cord just above the testicle. The average number of twists was about two, but varied from half a turn to four or five. The direction of the twist is impossible to state, owing to the tremendous confusion of terms which exists. As a probability it may be suggested that the twists are in different directions on each side: that on the right would appear to be as in withdrawing a corkscrew, counterclockwise; that on the left would appear to be as when inserting a corkscrew and with the hands of a watch held with its back to the abdomen, clockwise. The directions of the twist are precisely opposite on the two sides. In these cases it is common to get a history extending over some time, even years, of attacks of pain, particularly after some exertion; in which circumstances multiple twists are generally found. It must not be supposed that the testicle suddenly spun round giddily like a top! The truth is that *these twists represent the summation of many little increments of torsion added from time to time; thus accounting for the clinical history of frequent attacks of pain.* There are two sets of factors in the production of these twists of which we are certain, disposing or causing, passive or active factors. Of the former, one is the nearly universal presence of some developmental deficiency, often recognized as imperfect descent in the testicle; another being the vascular changes which occur in the gland and cord at the onset of puberty, as is indicated by the fact that the majority of examples of torsion of the cord occurred about that age. An active cause, muscular exertion, was found to be present in about 50 per cent. of the cases. In about 8 per cent. the attack came on during sleep, and in about 12 per cent. it was attributed to a "blow of sorts," and in the remainder, 30 per cent., no adequate explanation was offered. However, by going into the history of the cases, there is no doubt of three things: *firstly*, the developmental defect; *secondly*, the changes of puberty; and *thirdly*, some muscular effort, which precipitated the onset of the final attack. Sometimes (30 per cent. of the known cases) the onset occurred without any attributable cause; even during sleep in 8 per cent. This does not forbid the action of some muscular effort; for instance, the effort may be so slight as to be unnoticed; a case has been recorded in which a man had an attack of pain whenever he crossed his legs in a peculiar way. This muscular force must be divided into two classes: one concerning movements of the legs; and the other, the raising of the abdominal pressure as in straining or lifting. In the first case, the testicle is twisted directly ; in the second, it is twisted indirectly as the spermatic cord is expelled from the abdomen by the effort. The first is like twisting a ball attached to a string ; and the second is like twisting the string attached to the ball.

A. Cases when the **twist is above the epididymis** are characterized by the history of previous attacks of pain followed by swelling, each attack leaving the organ more prone to subsequent ones.

B. When the **twist is through the mesorchium** it can extend to the epididymis and might even reach the cord above the testicle in chronic cases. But as a class, the cases are more acute than those in class *A*. They may give histories of previous attacks of pain, but they are less often found ; and when they are, the attacks are usually shorter and sharper, in fact they are isolated torsions which undo completely as the attack ceases and do not represent an increment, as in a case of multiple or compound torsion. In class *A* the torsion is compound ; in class *B* it is simple. When the twist is in the mesorchium it is usually one twist only, or even only half a twist which has produced the symptoms. These cases are associated with the condition which has been described as the movable or wandering testicle. The twist is not so directly associated with the vascular changes of puberty as are those of class *A*. It is possibly due to the organ entering the external abdominal ring, and in doing so its long axis undergoes a half twist to accommodate itself to the triangular shape of the opening in the tendon of the external oblique. When expelled from the inguinal canal it may receive such an increment of the twist that hampers the spontaneous reduction when the organ is free in the scrotum. Thus the examples of this class are like those in the former in being associated with a developmental defect and a muscular effort, but are unlike in occurring generally before puberty and being acute rather than subacute or chronic.

There is no line of demarcation between these two classes, *A* and *B*. Sometimes the twist may extend from the mesorchium to the spermatic cord, and sometimes it is found through the epididymis.

This concludes sufficient of the pathogeny of these cases as it is desirable to insert in this small work. Attention will now be given to some of the various clinical aspects under which these cases present themselves, an example, previously unrecorded, being quoted in illustration.

ACUTE TORSION[1]

The first cases in which rotation of the spermatic cord or testicle was noticed were those in which the clinical picture resembled that of a strangulated hernia. As an example of this, a case of my own may be given. W. B., aged twenty-six, was admitted to St. Thomas' Hospital on May 22, 1902, in the morning. He gave the following history. The right testicle had never been so low as the left, and apparently was incompletely descended. Moreover it used to go up into the body still more at times. When eighteen years of age he had an attack of sharp pain in the testicle and it was at this time that he noted that it was smaller than the left. This attack was treated with applications of ice and passed away after lasting a week, two days of which he was in bed. There was no cause to which he attributed the onset. After this he had had occasional sharp attacks of pain in the testicle which lasted only a short time, sometimes occurring during and after sexual excitement. On May 20, two days before admission to this hospital, pain again started in the right testicle, accompanied by vomiting. Bowels last opened on the day previous, May 19. A medical man was called in and attempted to reduce the swelling which had appeared in the groin. During the manipulations the patient heard a click and the pain ceased instantly. He had relief for twelve hours, and then the pain came on again more severely and the swelling increased rapidly in size. The attending doctor again tried taxis, and this time failed to relieve the pain. There was no cause to which the onset of the attack could be assigned. On admission the patient had a very tender and slightly inflamed hernia-like swelling in the right inguinal region and scrotum, which was fluctuating, irreducible and yielded no impulse on coughing. The testicle was impalpable. Operation was decided on immediately, the case being diagnosed as a strangulated hernia in a congenital sac, as the testicle could not be felt. When opened, the sac was found to be full of brown fluid. The testicle was situated just outside the external abdominal ring, and lay with its epididymis to the outer side and behind, the cord having undergone two complete twists, counterclockwise in direction. The cord was drawn down, transfixed, ligatured with silk, and the testicle removed. The conjoined tendon was then sewn to Poupart's ligament with fine silkworm gut, the external oblique was united with the same material, as also the skin. The convalescence was uninterrupted, the wound healing by first intention.

---

[1] Published for the first time.

The parts removed may be briefly described as follows. The testis was of a blue-black colour and on section seemed firmer than normal. The spermatic cord had four half twists, counterclockwise, i.e. two complete twists just above the testicle, which were quite tight, leading to thrombosis of the veins in the cord, and doubtless also of the spermatic artery. There were also some slight adhesions about the twists which were easily undone. The tissues of the tunica vaginalis and scrotum were very oedematous. The tunica vaginalis was distended with old blood and formed a large swelling, which had extended to the groin.

This is an example of by far the majority of the recognized and reported cases. It illustrates :—

1. The recurring attacks of pain which subsided.
2. The reduction of the last stage of the twist by taxis.
3. The recurrence of the twist giving rise to thrombosis of the vessels of the cord.
4. Clinically, in the repeated attacks, and pathologically, in the two complete twists, it can be recognized that the final strangulation represented the summation of a series of small twists.
5. The swelling in the groin had no impulse on coughing as the thrombosed cord tightly filled the inguinal canal. Hence the close likeness to a strangulated hernia.

SUBACUTE TORSION [1]

The pathological changes that result from torsion may be so subacute as to present similarity to a painful irreducible hernia probably containing omentum.

T. N., aged fifteen, was admitted to St. Thomas' Hospital on September 11, 1901. He had had a lump in his left groin all his life, and also an imperfectly descended testicle on that side. He has had four or five attacks of pain similar but not so severe as that which caused him to seek admission. Generally they have lasted two or three hours, and have been unaccompanied with sickness. The first began six months previously, just after the onset of puberty. Two days ago he went for a walk through the fields, and on returning laid down on a sofa, when he noticed that the lump in the left groin had become tender and painful. He assigned no cause for the pain. On examination in the left groin was a lump the size of a walnut, which is said to be larger than it was before admission. The skin over it is slightly reddened and the whole is painful and tender. The left side of the scrotum is empty. The mass is irreducible and gives no impulse on coughing. Whilst walking about the ward the lump got larger and harder, and he was suddenly seized with an attack of pain after which it became very hard. Eleven days elapsed before operation.

---

[1] Published for the first time.

A curved incision was made over the tumour with the convexity upwards and the skin reflected from over the mass, to which it was adherent. The tumour was situated between the external oblique tendon and the skin. The tunica vaginalis was very thick and contained some brownish bloody fluid. On its deep surface it was adherent to the external oblique and had to be dissected off it. The mass was continuous with one filling the inguinal canal. After being freed an omental hernia was

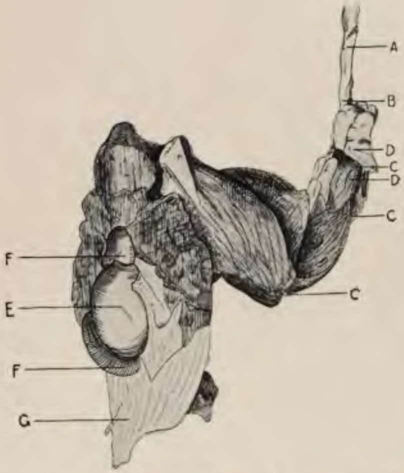


FIG. 17.—Parts removed from a case of subacute torsion of the testicle.

A A string of omentum which was adherent inside the hernial sac which accompanied the deformity.
B The divided neck of the hernia sac.
C The constrictions where the cord is twisted round the sac.
D Two of the portions of the sac between the twists, distended with bloody fluid.
E The testis.
F The epididymis.
G The tunica vaginalis laid open.

[*To face page* 116.

found in the upper part of a congenital sac of peritoneum. The abdominal end was sewn up with fine silk and the inguinal canal closed in two layers with stout silkworm gut. Owing to the size of the tumour removed a large "dead space" was left behind in which blood and serum collected. This was evacuated on the seventh day after operation but subsequently became infected, leading to the formation of a stitch sinus.

The parts removed consisted of a mass V-shaped in appearance, the abdominal end filled with adherent omentum and the opposite pole occupied by a smallish testis, dark and discoloured. The tunica vaginalis, which was immensely thickened, had been adherent to both the skin and the external oblique. It had contained brown bloody fluid. Between the two ends the mass was quite solid and presented a moniliform appearance due to the spermatic cord having wrapped three to four times round and constricting it, the intervening portions being distended with blood.

This case illustrates :—

1. The onset of symptoms at puberty.
2. The subacute course of the symptoms.
3. The recurrent attacks, about seven or eight in number, the multiple twists found.
4. The absence of an impulse on coughing on account of the adhesions, giving it likeness to a strangulated omental hernia.

SUBACUTE TORSION OF THE CORD WITH HAEMORRHAGE INTO THE TESTICLE[1]

F. H. A., aged fourteen, was sent to me by Dr. Kenneth Lund. Two months previously the right testicle had begun to swell. The pain was only slight, but the patient had felt seedy for a time. The swelling subsided in twenty-four hours after the cessation of the pain. One month ago the swelling recurred with acute pain and vomiting, which lasted one night. Since then there has always been pain in the gland, which has continued to increase in size slowly.

On examination the right testicle was much enlarged, extending from the spine of the pubes to the bottom of the scrotum. The left testicle was obviously imperfectly descended, as was also the right until the enlargement made it appear to be fully descended. The swelling was tender, and on the front and inner side presented an area of fluctuation, which was found subsequently to be bloodclot. The cord itself was hard and tender as far as the external abdominal ring. Pressure over the inguinal canal gave rise to no pain.

The right testicle was removed, and when opened both the testis and epididymis were found infiltrated with blood, whilst between them was a large haemorrhage.

---

[1] Published for the first time.

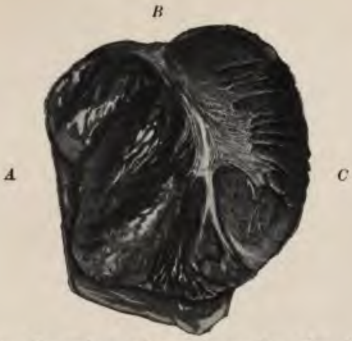


FIG. 18.—Drawing of specimen by the Author (*see* case, p. 118).

A Testis.
B The caput epididymis or globus major.
C Large haemorrhage in the body of the epididymis.

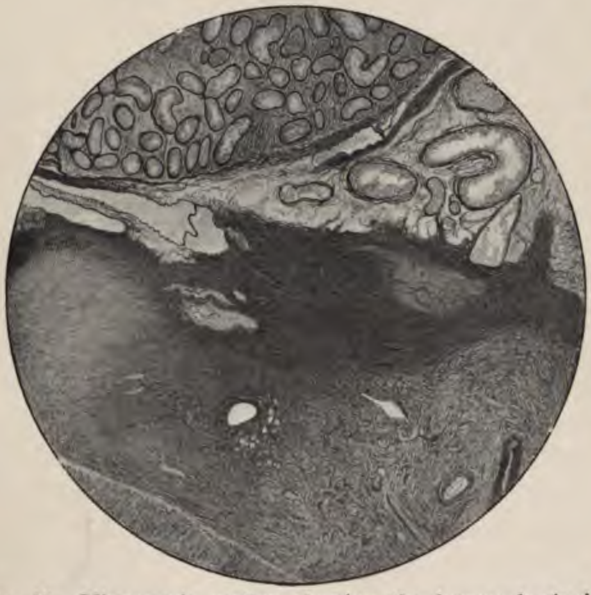


FIG. 19.—Microscopic section showing the haemorrhagic infiltration of the testicle at the upper part of the section and of the epididymis on the right.

[*To face page* 118.

The testicle on the left side was replaced in the abdomen—orchidocoelioplasty.

CHRONIC TORSION[1]

Recurrent Attacks of Pain in an Undescended Testicle

G. F., aged nineteen, admitted to St. Thomas' Hospital May 26, 1902. Has only had the right testicle completely descended. The left lies over the inguinal canal and causes pain. He has had several slight attacks of pain, the most severe being about three years ago and was accompanied by nausea, no vomiting, but obliging him to give up work for a time. Prolonged standing always gives him a dull aching pain in the testicle. On May 29 a curved incision was made over the tumour and the skin reflected therefrom. The testicle lay over the inguinal canal between the skin and the external oblique, to which the tunica vaginalis was adherent through chronic inflammation. The epididymis lay to the outer side of the testis, which had taken one complete but not tight twist. The inguinal canal was opened up, and a small acquired hernial sac found at the top. As the testis was considerably smaller than the right and the boy had developed all the characters of a man, the organ was removed and the inguinal canal sewn up with fine salmon gut. After the operation the temperature never rose above normal, the wound healed by first intention, and the stitches were removed on the eighth day. The boy was somewhat neurasthenic for two or three months afterwards, fearing attacks of pain, but ultimately recovered completely.

---

[1] Published for the first time.

This illustrates :—

1. Onset dating from puberty.
2. Recurrent attacks of pain associated with torsion of the cord.
3. The consequent wasting of testis.
4. The associated developmental defect; in this case, imperfect descent.

VARIOUS CLINICAL EXAMPLES

Dr. Perry, of Birmingham, has recorded the case of a young man of twenty-five who had had many recurring attacks of pain in the testicle, which began when he was eleven years old and recurred every two to three months for fourteen years, when a more acute attack supervened which Dr. Perry untwisted. He has had several slight attacks since then which he untwists himself. Dr. Perry says that the gland is definitely smaller than the other, but is not actually atrophied. Apparently it is in a normally descended testicle. Dr. Nash has described a similar case of which two years later he reported atrophy of the gland. These cases illustrate the effects of chronic torsion of the cord on the testicle, the relief of the subacute pain by untwisting the cord, and, finally, that in future steps should be taken early in such cases to avoid atrophy of the gland.

Cases of thrombosis of the cord and necrosis of the testicle have been recorded. In some the testicle atrophies. Further, torsion of the cord has been found to be at the bottom of cases of hydrocele or haematocele of imperfectly descended testicles. In some cases an abscess is formed in the scrotum and a necrotic testicle is discharged. In conclusion, a case of subacute torsion will be described which was diagnosed as orchitis.

A boy, two and a half years of age, was admitted to the Hospital for Sick Children, Great Ormond Street, for swelling of the testicle in the right groin. The tunica vaginalis was distended with fluid, but not too tightly for an enlarged tender testicle to be felt within it. The testicle was imperfectly descended and the mother had noticed its apparent disappearance on several occasions. The case had been diagnosed as orchitis in an imperfectly descended testicle. Feeling that subacute torsion of the cord was much more likely, the case was taken to the theatre and operated on. The tunica vaginalis was found full of slightly haemorrhagic fluid, the testicle was blue black in colour and the mesorchium was twisted completely once, counterclockwise. The twist involved the tail of the epididymis. The testicle was removed. The wound healed by first intention.[1]

Treatment.—In acute cases, operation should not be delayed. In far and away the majority it will be necessary to remove the testicle, as it has been injured beyond recovery and will only atrophy if sutured in the scrotum. In the subacute cases the twist can often be undone by turning the organ in the direction which gives the patient relief. But this must be regarded merely as a temporizing measure, to be followed by further reduction of the torsion and suture of the gland in the scrotum to avoid recurrence or its replacement in the abdomen. Sometimes it will be found necessary to remove the organ. In the chronic cases, operation should always be urged in the hope of saving the gland from future harm. In fact, to put it shortly, to diagnose torsion of the testicle is tantamount to advising operation.

---

[1] This case is published for the first time.

CHAPTER VIII

EPIDIDYMITIS AND ORCHITIS

When inflammation affects the body of the testicle alone, we speak of it as orchitis ; when it involves the epididymis alone, we speak of it as epididymitis ; and when it involves both of these structures, it is called epididymo-orchitis. It is not often that an inflammatory lesion really affects one part of the testicle alone, but it may apparently do so. In orchitis, the epididymis does not escape entirely ; neither does the body of the testicle in epididymitis : but the terminology is given according to which factor predominates. Thus nearly every case is an epididymo-orchitis in which the two components may be affected very differently in degree. This point is illustrated by the accompanying diagrams (Fig. 20, p. 129), which indicate the different conditions according as the influence of each factor predominates. In children, epididymitis is rare, the testis being affected ; in adults, the epididymis rarely escapes.

Epididymo-orchitis arises in four ways: (*a*) as the result of injury; (*b*) from direct extension of inflammation; (*c*) from infection through the blood stream; and (*d*) most frequently, from infection up the vas deferens. The infection may be the result of acute or chronic disease of the urethra, prostate or vesiculae seminales, gonorrhoea or any form of urethritis such as the gouty, after urethral instrumentation or operation. Infection through the blood stream is found in the orchitis which occasionally complicates gout, rheumatism, tonsillitis, influenza, mumps, lumbago and some specific fevers. The body of the testicle is generally affected in these cases. For instance, in mumps, the epididymis generally escapes. The inflammation begins about the eighth day of the attack; the subjects being boys and young adults, not children or old men. It is rare but not unknown for both glands to be affected one after the other. The attack runs its course in about four days and then subsides. The disease usually ends in resolution but atrophy is common, the gland beginning to dwindle about two to three months or more after the attack. In typhoid fever the attack seems to last longer, six to ten days, and more frequently ends in suppuration. In malaria, it only lasts two or three days; whilst in gout, it is apt to be a very obstinate and troublesome affection.

To put it shortly, urethral infections affect the epididymis, the body of the testis becoming infected from that; when the infection is through the blood stream the case is usually reversed, the testis being the part which is first affected.

Pathology.—In urethral infections, which are by far the most frequent, the vas deferens often shows signs of inflammation before the infection reaches the epididymis. It reaches the lower end, the cauda epididymis, first, so that is the point which is chiefly affected. As the infection spreads up the epididymis that structure becomes enlarged and swollen; the testis becoming affected afterwards. Epididymitis of urethral infection is always septic but not always obviously suppurative. The ducts and convoluted tubules may be filled with pus which will kill any spermatozoa which are there. When the abscesses discharge through the ducts, the suppuration is not obvious. The fact that small suppurative foci may remain in some of the convolutions constitutes the graveness of the risk of conveying the infection to some woman, as in marriage, long after the apparent cessation of all trouble. The author has known a case in which gonococci were found in the urethra five years after the infection!

The inflammation which results from blood stream infections is first seen in the swelling of the body of the testicle. The inflammation may subside, or go on to suppuration, and even to necrosis of the testicle. It may resolve entirely, but, particularly in children, the organ will atrophy or cease to grow; and in young adults it will very likely atrophy in the course of the succeeding months. The greater pain in orchitis is attributable to the difficulty of expansion or the compression of the swelling testicular tissues by the strong tunica albuginea.

The symptoms differ somewhat according to whether the epididymis or the testis is the more affected. It may be stated generally that the signs and symptoms are more severe with the latter than the former, but suppuration is more frequent in the epididymitis. Premonitory general symptoms frequently precede the advent of local signs by some few hours. Thus, the patients suffer from fever, headache and general malaise. This is often followed by pain which is referred to one side or other of the lower part of the abdomen. Should the patients desire to conceal the condition of the genitalia, as is not infrequently the case in gonorrhoeal infections, it is easy for the practitioner to be misled by these abdominal symptoms; especially if they are on the right side, as the question of appendicitis will be raised in his mind. Soon, local swelling and tenderness are manifest: the epididymis feeling like a boat-shaped enlargement on the outer and back part of the testis; the swollen testis is smooth and globular, retaining its outline.

The pain is peculiar and sickening ; the parts being exquisitely tender. These signs may speedily become masked or perhaps hidden by the effusion of fluid into the tunica vaginalis which forms a symptomatic hydrocele. Sometimes the effusion is so great and so rapid as to have suggested the name of acute hydrocele. The scrotum may become red, swollen and oedematous. All the signs and symptoms become worse if the testicle is allowed to hang down, when the dragging pain in the abdomen is particularly bad. Rigors occasionally usher in the attack. In most cases, the temperature remains elevated for several days, emphasizing the suggestion of the probable suppurative nature of the infection. Usually the acute symptoms last four or five days, occasionally seven or eight ; and in about a fortnight the patient is convalescent. Should the attack occur in the course of urethritis, the discharge diminishes or ceases, returning during the convalescence. If both sides are attacked, they are so one after the other, and not simultaneously. Some hardness and thickening persist for some time afterwards. Atrophy occurs slowly and not infrequently, especially in young subjects. Occasionally, the gland remains permanently enlarged, but it is doubtful if it is ever so fruitful after the inflammation as before. And further, it may always be a grave danger to any woman with whom connexion is had. In urethral infections it is not infrequent for a hard nodule to remain permanently in the cauda epididymis.

Treatment.—The patient must be put to bed, have the scrotum raised and supported and an icebag applied. An evaporating lotion is sometimes employed; likewise, hot fomentations. The bowels are freely opened with a purgative, such as calomel and sulphate of soda, and a saline mixture given three times daily. If there is much pain some tincture of opium can be added; and in plethoric subjects, twenty minims of antimonial wine also. The diet must be light and easily digested. After the acute symptoms have subsided, the testicle can be strapped; and, in any case, a suspensory bandage should be worn for a short time. If obvious suppuration takes place the abscess must be incised. When orchitis occurs in the course of some specific disease, such as malaria or gout, appropriate remedies must be given. In every case attention must be given to the original source of the infection, such as the urethral discharge after the acute symptoms have subsided.

CHRONIC EPIDIDYMO-ORCHITIS

In the chronic forms, the affections of the epididymis and testis are much more distinct than in the acute. So that a chronic epididymitis and a chronic orchitis can be considered with advantage. By this is meant the chronic simple and chronic septic irritations, not the tuberculous and the syphilitic.

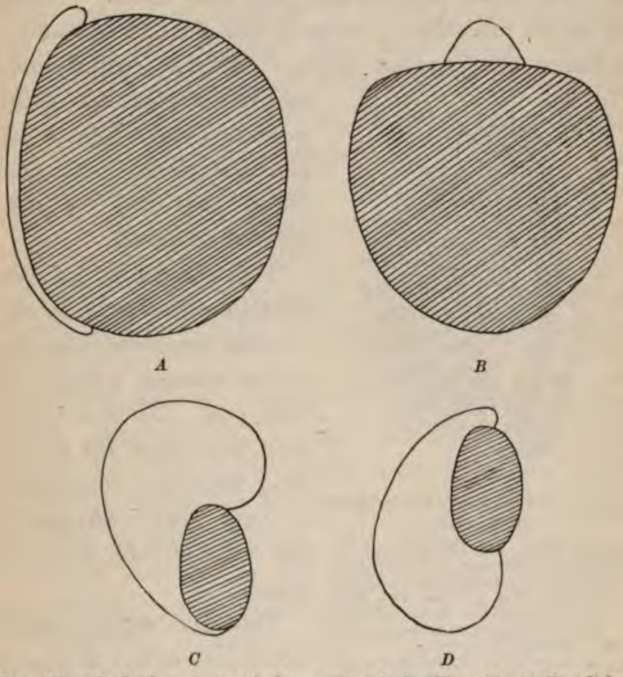


FIG. 20.—Relative sizes of the parts of the Testicle in Epididymitis and Orchitis.

A Side view in orchitis.
B Cross section of testicle in orchitis.
C Enlarged caput epididymis, the globus major, in epididymitis.
D Enlarged cauda epididymis, the globus minor, in epididymitis.
The enlargements have been exaggerated to demonstrate the differences.

A. Chronic epididymitis is almost always the result of acute or subacute epididymo-orchitis which arose from urethral infection. In consequence, it is recognizable as a hard lump or nodule in the cauda epididymis. But sometimes nodules in the caput epididymis are the result of mild pyogenic infection of some of the clusters of seminal tubules congregated there. Chronic epididymitis has two aspects whose importance outweighs other considerations, so that these two will be considered in detail.

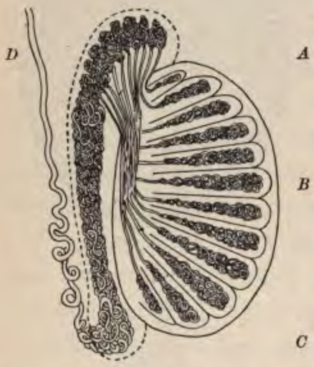


FIG. 21.—Diagram of Structure of Testicle.

B is the testis, *A* is the globus major or caput epididymis, in which the numerous vasa efferentia join up to form one duct which proceeds with many convolutions to the globus minor or cauda epididymis, *C*, to become the vas deferens, *D*.

A lesion below the caput epididymis can block a convolution of the solitary duct and easily produce sterility.

The chronicity of the inflammation may be due to mild pyogenic infection of the tubules, which contain pus. Such a condition can exist for a very long time and constitutes a very grave danger to the wife should the man marry.

That the septic condition is still active is shown by the enlarging of the nodules from time to time, which become at the same time more tender. These changes must be distinguished from the aching pain commonly felt by sufferers from chronic epididymitis during excitement or physiological congestion.

The nodules by the contraction of the fibrous tissue which composes them may cause sterility. The lower they are in the epididymis the more certain is the sterility they may cause. It is a progressive change and may take years to come on. When it does come on, it constitutes a pathological division of the vas deferens.

For instance for seven years or so a patient was fertile ; then an examination of the semen showed that no perfect spermatozoon was present, only separated heads and tails ; he married later, and though some years have elapsed the wife has borne no children.

It is a difficult disease to treat ; blisters and other counterirritants and mercurial ointments should be tried. Electrical treatment has sometimes improved the condition but has also led to disappointments. Great care should be taken to ascertain whether or not there is any tuberculous or syphilitic taint in the affection.

B. Chronic orchitis is more frequently the result of some vascular than some septic lesion. For instance, after an injury to the spermatic vessels or the operation for varicocele (pp. 98–105). It is usually associated with a testis which is larger and harder than usual. In a few months time it may be followed by some diminution in size and even obvious wasting. Thrombosis of the vessels of spermatic plexus is more commonly associated with it than is thought. If such thrombosis is present with an acute orchitis, such as one sees after mumps, the testicle may remain permanently enlarged. A chronic orchitis, especially if of long standing, does great harm to the spermatogenetic function of the testis of an adult ; and in the course of time will abolish it completely, practically producing a condition which may be called a pathological castration. Hence if such a gland is painful or neuralgic, one need have no scruples on physiological grounds in excising it. Chronic orchitis is essentially a disease of the adult or sexually active individual, but it is seen occasionally in children, when it will cause atrophy or at least cessation of growth in the gland.

Treatment.—Drugs have little effect on this condition. Iodide of potassium, and perhaps mercury, is given internally ; and counter-irritation and the inunction of mercurial ointments externally. But the patient will derive more benefit if attention is directed more to the general health than the local. Fresh air, exercise, change of scene and life, or a voyage will do much good, although the local disease runs its course. The use of a suspender is often imperative on account of the dragging, sickening abdominal pain which the weight of the testicle causes. Sufferers from this complaint often get very depressed mentally.

CONGESTION

There is no doubt that there really is a condition of hyperaemia and increased vascularity of the testicles, such as in those accustomed to frequent sexual activity. It is uncertain that there is a periodic increased vascularity in any way comparable to the menstrual periods of women. Congestion of the testicles can give rise to feelings of discomfort and aching. But, in general, those who complain of these symptoms are of the enervated and perhaps prurient class of males; neither healthy, vigorous, nor clean minded. Discomfort and aching associated with firm tense testicles in the contracted scrotum of a vigorous individual may mean true congestion; and if relief is obtained it will be found that the glands have lost some of their tenseness. The best method of estimating this is by means of the sense of fluctuation which the healthy gland gives. But one knows that vigorous healthy minded people rarely complain of such symptoms, and that the majority of those who present themselves with congestive symptoms are enervated and weakly with pendulous scrota and flabby testicles. Hence the complaint much more frequently indicates sexual neurasthenia than testicular congestion.

TESTICULAR SUPPURATION

Clinically, it is unnecessary to make the distinction between septic processes in the epididymis or in the body of the gland, the testis. In this section, suppuration in connexion with tuberculous and syphilitic diseases is not considered. Abscess formation is very rarely found in epididymo-orchitis which is the consequence of infection through the blood stream. It occasionally occurs after typhoid and a few other specific fevers ; but very rarely, if ever, after the most frequent example of such infection, the orchitis of mumps. When abscesses (not tuberculous or syphilitic) occur in the testis or epididymis they are practically always the result of urethral infection. And if one looks through these cases, such as the notes of those who attend a hospital, it will be found that urethral and prostatic instrumentation or operations are responsible for the great majority of them ; uncommonly the abscess is secondary to infection consequent upon some urethral, prostatic or vesical disease. Such abscesses may spread along the cord, but it would appear that these cases are really examples of separate foci of infection which later run together rather than of the direct spread of a single abscess. The tunica vaginalis may become infected and form a pyocele.

Symptoms.—The onset is like what has been described under epididymo-orchitis, but is usually of the milder rather than the more severe type. Curiously, in some instances, the symptoms are very mild. The initial pain is eased when the pus has made its way through the tunica albuginea, relieving the intratesticular tension. At this time, the scrotum swells and becomes red, hot, glazed, oedematous and particularly tender and painful over the part where the pus has perforated the tunica albuginea.

Treatment.—Early incision is of superlative importance in order to save the physiological secreting parts of the gland from destruction by suppuration, necrosis or fibrosis. If this is done, healing is rapid : if it is not, fistulous tracts and sinuses may remain and the seminal tubules herniate through the opening in the tunica albuginea ; or when the abscess bursts spontaneously, a necrotic testicle may be discharged. The author has more than once seen this occur, in connexion with suppuration in the wound of a radical cure for hernia ; and probably for two reasons, thrombosis of the vessels of the spermatic cord and the extension of the sepsis down it to the testicle.

FUNGUS TESTIS

Fungus or hernia testis is an old name applied to a condition which is rarely seen in these days of modern diagnosis and treatment. As its occurrence often shows negligence on the part of the patient or incapacity on that of his attendant, it does not behove that much be said. In this condition the testicle, wholly or in part, or some structure connected with it is protruded through an opening in the scrotum. It may be the result of an injury such as laceration of the scrotum, a scrotal abscess, tuberculosis, syphilitic disease, widespread tissue necrosis as from extravasation of urine, or growth. Only in the first instance is the testis itself herniated; in the other cases, the protrusion is usually a mass of granulations or growth.

Treatment must be adopted according to the cause. But in nearly all cases, operative treatment becomes imperative.

SYPHILITIC DISEASE OF THE TESTICLE

From their deep situation these structures are never affected in the primary stage of the disease. In the secondary stage the testicle is infrequently affected; when it is, the epididymis is affected more obviously than the body of the testicle, which is unusual in blood infections. Both epididymes are affected, appearing enlarged and tender with a localized nodular mass in globus major or caput epididymis. If a careful examination is made, it will be found that the disease is really an epididymo-orchitis, in which the epididymal factor predominates. The average duration of the syphilis before the incidence of this epididymo-orchitis is about four months.

The diagnosis is generally easy from the history, the presence of other secondary syphilitic lesions, the similar and bilateral affection, and its rapid resolution under treatment with mercury.

In the tertiary stage, the testicle is subject to two pathological invasions ; a diffuse gummatous infiltration and the formation of a distinct localized gumma, or gummata. These processes cause a form, the syphilitic one, of epididymo-orchitis, but it is the testis rather than the epididymis which bears the brunt of the trouble. A testicle affected with tertiary syphilitic disease is often called a sarcocele, to be uniform with the nomenclature of other scrotal tumours, such as a hydrocele or haematocele.

(*a*) In the **diffuse gummatous infiltration,** the gland is invaded along the course of its blood vessels with a host of round cells of connective tissue origin. Speedily the whole organ becomes enlarged and permeated by them. If treatment is adopted at once, more or less perfect resolution may occur. If for any reasons treatment is delayed, the round cells become young fibrous tissue which by its contraction kills the epithelium, strangulating the gland as a physiologically valuable structure. This murderous process does not go on evenly throughout the organ ; different parts being in different stages of dissolution. But as treatment will only affect the gummatous tissue and not the fibrous, the resolution will be incomplete ; the organ remaining permanently enlarged, or becoming fibrotic and atrophied. It rarely returns to its original size and consistency.

(*b*) In **a local gumma of the testicle,** the invading round cells, instead of permeating the organ along the branches of its blood-vessels, remain collected together in a mass. Such gummata are often multiple in the testis. Under timely and appropriate treatment, they may resolve more or less completely. They may undergo fibrosis leaving a local scar behind, or caseation, cretification, or suppuration. Sometimes the gland atrophies later. When the organ is much enlarged both the processes described above, *A* and *B*, are present together; the individual gummata being like knots in the network of gummatous infiltration. Further, the tunica albuginea, either directly from syphilitic disease or indirectly as the result of the very slowly increased intratesticular pressure, becomes thickened. In the early stages there is a subacute or chronic inflammation of the tunica vaginalis causing the formation of a hydrocele, the fluid of which is often absorbed later. It is usually taught that the vas deferens is not affected; this is not true. The vas is always smooth, thickened and harder; more probably the result of the dragging of the heavier testicle than from the direct action of the syphilitic virus.

Symptoms.—The testicle slowly, insidiously and painlessly enlarges, until its size and weight cause the patient to seek advice. In shape, it is usually globular and pyriform with a smooth surface. It is heavy, painless, hard and resistant to the touch; and generally devoid of the peculiar testicular sensation. The skin of the scrotum may be adherent to it and may even present a gummatous ulcer and hernia testis. A small hydrocele is often present. As a rule, one testicle only is affected, rarely both simultaneously; and—what is curious and may create a smile on the face of the unbeliever—the testicle of the other side may become affected whilst the patient is under treatment for the first!

Diagnosis.—In general the diagnosis is either easy or impossible. Except in children, as a rule tuberculous disease can be easily excluded. The two things which often cannot be excluded are haematocele and new growth. When this is so, the testicle as a testicle is probably no more, having been destroyed by the pathological processes; it has merely the cosmetic value of a lump of scar tissue. In consequence, it is wrong to pursue treatment with drugs. An exploratory operation should be advised with permission being given to act as the surgeon thinks best. There is no great advantage to the patient in the surgeon's leaving him a mass of gummatous tissue which may be called politely a testicle. It is by no means uncommon, particularly amongst the inexperienced, to find a tense hard hydrocele mistaken for a sarcocele. Transillumination quickly decides the matter and should prevent mistakes ever being made the opposite way, mistaking a sarcocele for a hydrocele.

The presence of signs of syphilis elsewhere have value in directing the practitioner's attention to the possibility of this disease in the enlarged testicle, but unless the suspicion is confirmed he has no right to sacrifice his patient, who possibly has malignant disease, by giving prolonged medical treatment for a mere guess.

It is by no means unknown to find both syphilitic and tuberculous disease present together in the testicle.

HEREDITARY SYPHILITIC DISEASE

The mere fact that the contagion is transmitted from the parent, instead of by the ordinary means of infection, in no way modifies the main features of the disease. Though we know that by transmitting a disease through an animal we can magnify, minify or maintain its virulence according to the susceptibility of that animal, we do not change the main features of the disease. Hence syphilis is syphilis no matter how contracted; inherited syphilis differs from "acquired" syphilis in one great feature, namely, it affects a growing developing unit; not one already fully grown. In consequence, it can affect that growth and development, presenting characteristic features.

When found in the testicles it usually affects the testis in the form of a diffuse gummatous infiltration. Both organs are often attacked. It is often accompanied by a hydrocele. Atrophy or nondevelopment of the organ follows in most cases. It is impossible to exclude the presence of tuberculous disease unless it declares itself obviously, such as by breaking down, etc. And further, there is reason to believe that both tuberculous and syphilitic disease are to be found together in some of these very young cases. In syphilitic cases, there is often a definite history and definite signs of the disease elsewhere.

The Treatment.—The treatment of syphilitic diseases of the testicles is the same as the treatment of the same stage of the disease elsewhere. Hence there is nothing new to be advocated, and it is merely necessary to point out yet again the dire results, to the physiological value of the gland, of neglect or inefficiency in the carrying out of the treatment. In its imperfect resolution, fibrosis, caseation, etc., a gumma may destroy the functional value of the gland completely. In consequence of this and the difficulty experienced in many cases at arriving at a certain diagnosis, the practitioner should not hesitate to recommend operative measures.

TUBERCULOUS DISEASE OF THE TESTICLE

Tuberculosis of the testicle is a replica of the same disease which we know by the name of phthisis in the lungs. It is the same pathological process modified slightly by its different situation. Again, the effect of its presence will materially alter the value of the gland from a useful and physiological point of view. There are three chief channels through which the testicle can be infected; through the lymphatics, the blood-vessels and the vas deferens. It may occur as a primary disease, or as secondary to tuberculosis elsewhere, or as an incident in the general miliary infection of the body. In the last case, its involvement is an insignificant item in the disease and in no way merits further consideration. In the case of the lymph or vascular systems, the infection is usually spoken of as by indirect extension; and with regard to the vas deferens, as due to direct extension. As these two classes differ somewhat in physical signs, it will be as well to consider them separately.

(*a*) Due to indirect extension and other primary infection.

In these cases the disease is first noticeable as a nodule in the upper part of the epididymis, the globus major or caput epididymis. This nodule, if it progresses, grows, hardens, and then softens, if it breaks down. Generally one or more other nodules appear during this progress. Indeed, the epididymis may become moniliform, like a string of beads. The usual explanation given for the marked predilection of blood infections to settle in this place is because it is the region of the division of the spermatic artery into many minute and tortuous branches, the infection being embolic. Considering the microscopic size of the bacillus this explanation seems inadequate. And rather would it appear, that the organisms settle in this place because it is, so to speak, the first resting-place and tissue which they reach; just as a railway station often is the first settling place for the luggage and travellers who arrive there. But similarly, as the station is the first settling place, so does it become the centre from which the passengers and luggage are dispersed. Tuberculosis of the epididymis disperses along the vessels and lymphatics of the seminal tubules, and in a short time will invade the testis.

(*b*) Due to direct extension *via* the vas deferens; infection generally secondary.

The infection in this class is usually secondary to some disease elsewhere in the genito-urinary tract, such as of the prostate or vesiculae. From its very nature, it is often a mixed infection, other organisms than the tubercle bacillus being present. Thus this form of testicular tuberculosis is very prone to follow upon some form of urethritis, gonorrhoeal or otherwise; whilst the cases in class (*a*) are not. As the infection takes place through the vas deferens, the earliest sign of the affection of the testicle is the appearance of a nodule in the lower part of the epididymis, the cauda or globus minor; it is this portion where the vas joins the epididymis. Or previously there may have been a nodule in this situation, the result of chronic epididymitis; in which case the tuberculous infection is merely grafted on the septic. As in class (*a*) the testis itself becomes invaded, but more slowly, by infection along the seminal tubules.

Having settled, the tubercles, as they are called, may undergo fibrosis, caseation, cretification or suppuration, according to the conditions under which they are. The first, fibrosis, is the natural cure of the disease. Its effect on the testicle will depend to some extent on its situation. If it is in the caput epididymis, the globus major, where there are many and separate seminal ducts, it may not block them all, and the gland will not be sterilized completely. If there are many nodules in this situation, so much greater will be the patient's chance of acquired sterility. Should the nodule be in the cauda epididymis, the globus minor, where there is only one seminal duct, the contraction of the fibrous tissue will pretty surely induce complete sterility as regards the gland in the course of time. When a tubercle undergoes caseation, it first increases in size and hardens; then, as the caseous material breaks down, it softens and forms a "cold abscess," which if secondarily infected with pyogenic organisms undergoes suppuration, becoming a hot one. These cold and hot abscesses in the epididymis have a great difference from those in the testis. The back part of the epididymis lies up against the skin and the dartos, with the result that abscesses easily and quickly "point" and break. Thus it is not infrequent to find healed scars adherent to the back of the epididymis, and to get the history of an abscess having discharged and healed. The proneness of tuberculosis to affect the epididymis rather than the body of the testis, through either or any channel of infection is so marked that any disease in the epididymis at once raises the suspicion of its possibly being tuberculous. But it must be remembered that, as the disease progresses, the testis itself becomes invaded. The situation of the more gross disease renders the influence which tuberculous disease will have on the testicle obvious. It will sooner or later sterilize the patient if bilateral by mechanically suppressing the external secretion. On the other hand, it will only slowly, and late in the course of the disease, affect the internal secretion. The majority of sufferers are adults in whom the internal secretion has done its work in rendering perfect the male characters, and to whom the external secretion only is of great use. So that, on physiological grounds, a tuberculous testis soon loses its value, merely constituting a danger to the patient.

If the disease was similar in children, the internal secretion would be of the greatest value; but, unfortunately, in them tuberculosis commonly involves the testis and shows much less of its proneness to affect the epididymis. Thus it tends to destroy the internal secretion of the gland before it has had time to develop an external secretion.

In adults and infrequently in children, the vas deferens becomes thickened, not uniformly, as in syphilis, but in a nodular fashion. A hydrocele frequently occurs although the epididymis alone may be involved. This is due to a tuberculous infection of the tunica vaginalis, comparable to a peritonitis, which is due to a similar tuberculous infection of the peritoneum. The glands in the groin become involved only if the skin of the scrotum does; but those in the iliac region may do so much earlier. The vesicula seminalis on the same side, if not originally affected, may become so from infection with the sperm which reaches it *via* the vas deferens. In a similar way the prostate and other parts of the genito-urinary tract may become infected. Should the condition of tuberculosis of the testicle arise in a married man, it becomes important for the practitioner to place before him the danger to which his wife is exposed by his having any connexion with her. The frequency of tuberculous salpingitis is probably often the result of infection with tuberculous sperm.

Symptoms.—Gonorrhoeal and general excesses undoubtedly predispose a man to tuberculosis of the testicle. Clinically the disease can be divided into three stages, which may be distinct or may overlap. The *first* is the stage corresponding to the deposit and fibrosis of the tubercle. In all probability it will be unnoticed by the patient though discoverable at an examination. If the nodule is in the caput epididymis and there are adherent scars at the back of the scrotum, the probability of the nodule being tuberculous is very great. If however the nodule is in the cauda epididymis, there will be great doubt as to whether it may not be some other form of chronic inflammation; in which case, the signs of tuberculosis elsewhere must be carefully looked for, such as nodules on the spermatic cord, vas deferens, in the corresponding vesicula or lobe of the prostate. Tubercle bacilli may be found in the semen or in a urethral discharge,

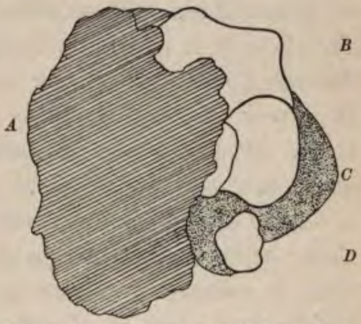


FIG. 22.—Advanced Tuberculosis in the Epididymis with a large focus of caseation, *A*, whilst the testis appears healthy to the naked eye but contained tubercles when examined with the microscope.

B The caput epididymis.
C The testis.
D The cauda epididymis.

in which case great care must be taken to distinguish them from the smegma bacillus, which is very like them. The presence of a hydrocele is indicative of tuberculosis rather than chronic epididymitis. The fluid in it is usually lymph, but it may become flocculent and even rarely a pyocele or empyema. It rarely if ever contains tubercle bacilli. The result of a cytological examination of the fluid may enable a diagnosis to be made (pp. 32–34).

In the *second stage,* the tubercle undergoes caseation. At first it increases in size and becomes harder ; then it softens in places as the caseous material breaks down and is absorbed. In the epididymis the skin soon becomes adherent and later red, giving way and discharging the cold abscess. It may be weeks, months or years before the patient passes from the first stage to this. Careless living and sexual excitement will tend to precipitate it.

After the abscess has burst, the resulting sinus generally heals, leaving behind an adherent scar. But sometimes it does not, when the disease enters on the *third* stage ; a sinus being formed, which opens on the surface as a typical tuberculous ulcer. Indeed, in some cases there are many sinuses and ulcers, the intermediate and surrounding skin being ragged, undermined and discoloured. The discharge is thin and watery, containing caseous material. These sinuses frequently heal and break down again ; either spontaneously as a result of a

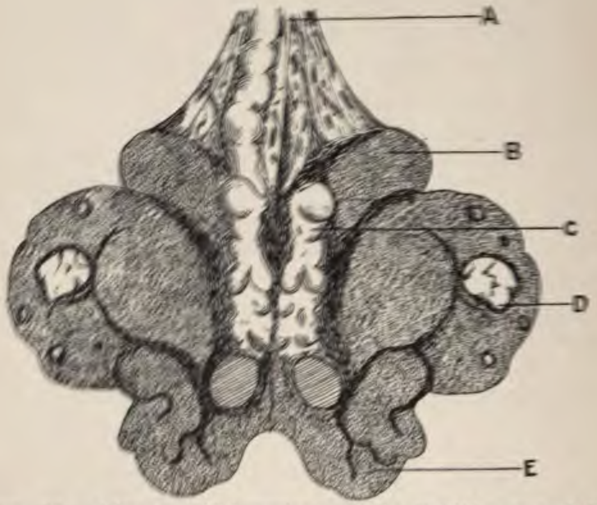


FIG. 23.—Advanced Tuberculosis of the Epididymis and Vas with microscopic foci of caseation in the testis.

A The spermatic cord containing the vas deferens which is monilliform from tuberculosis.
B The caput epididymis, not obviously infected.
C The body of the epididymis containing many caseating tubercles.
D The testis containing caseous foci visible to the naked eye.
E The cauda epididymis, enlarged but without obvious foci of infection.

[*To face page* **149**.

decline in general health, or as the result of a local injury. In this third stage of the disease, gross changes will commonly be found in the vesiculae, prostate, testicle of the other side or elsewhere.

The diagnosis as a rule is easy : tubercle primarily affecting the epididymis ; syphilis and growth the testis. Chronic epididymitis, the result of some form of urethritis affecting the epididymis, is very hard to distinguish from tuberculosis. The fact that tuberculosis often affects the caput epididymis, and chronic epididymitis the cauda epididymis, is of some help but merely a probability, indirect evidence. The presence of tuberculosis elsewhere in the genito-urinary tract is very suggestive of the presence of the same disease in the testicle. The disease may be very difficult to diagnose when so advanced as to render the testis and epididymis indistinguishable. But when this is the case, the testicle has ceased to have any value which could be an excuse for keeping it; the differential diagnosis of tuberculosis, gumma or growth becoming a mere pedantic refinement. *Diagnosis is only of practical value in giving prognosis and treatment, and of little or none as an accomplishment per se.*

Treatment.—In the first stage the treatment should consist of local rest, abstinence from sexual gratification and excitement, and generally leading a healthy open air life with plenty of sunshine, fresh air and good food. A voyage is an excellent thing, but sometimes unsatisfactory on account of the deleterious influences of seaboard acquaintances and opportunities. The local application of mercurial ointments is often beneficial, as also the internal administration of tonics and cod liver oil in suitable cases. In taking exercise care must be taken in selecting its form or by wearing a suspensory bandage to avoid inflicting injury on the part, particularly small and frequently repeated injuries. This treatment should be continued for some time after the apparent cessation of the disease. And the patient should be careful for some time afterwards, say six months or a year. If the disease, instead of quieting down, progresses or enters upon the second stage, medical treatment, though it must be continued, ceases to be sufficient. Occasionally the abscess discharges and cures itself. If caseation has taken place it should be treated as elsewhere by means of incision and erasion ; the skin being sutured and the wound kept aseptic wherever possible. But the conduct of the case and the course of treatment selected by the patient is not always in strict harmony with medical opinion. It is right, if the disease does not quickly settle, to raise the question of castration, to remove a largely valueless organ that is a menace to the rest of the body. As tuberculosis is often a local visible sign of a general and invisible weakness, it may break out elsewhere quite independently.

Hence general treatment should be continued and the patient warned.

In the third stage, castration is done not only for the sake of cure but in a—humanly speaking—incurable case to relieve the pain, discharges and sleeplessness which the disease may cause. At this stage, the presence of the disease elsewhere precludes the possibility of a cure.

The treatment of these cases with tuberculin, the progress being followed by the record of their opsonic indices, is of the greatest value. It is of the most use in the first stage, of less in the second, and of least in the third, on account of the mixed character of the infection in this stage. Indeed, very little is known of this treatment. In cases of surgical tuberculosis I have multiplied the opsonic index by two, three and four without apparent clinical benefit to the patients. Why some do not benefit, whilst some do, is not known. But this treatment should be tried with the assistance of a specially trained man.

TUBERCULOSIS OF THE TESTICLE IN CHILDREN

This affection is without doubt not so rare as was formerly taught. It has been overlooked on account of the painless and quiet way in which the disease sets in and advances in an organ which as yet carries out few if any functions. This is remarkable considering the harm which often results; namely, non-growth or atrophy of the part; a most serious condition as the child grows up. The disease is either acute or chronic. The child is usually brought to the doctor's notice for a hydrocele, which may be acute, containing purulent material or merely subacute, but is very persistent in recurring. Hydroceles in children have a far greater likelihood of coming to operation than those of adults. And it has often happened to me when operating on the hydrocele in the tunica vaginalis of a child to find it dependent upon a tuberculous testicle.

The diagnosis from syphilis may be very difficult, but the result, atrophy or non-growth, is the same. In syphilis both glands are more frequently affected; there is usually no hydrocele and there are other signs of the hereditary disease.

A mistake in the differential diagnosis may be of little moment, if a destroyed gland is removed. Syphilitic disease is so insidious that the child's testicles as useful glands are destroyed before the diagnosis is made. The disease, whichever it is, is almost invariably local; the vesiculae, cord and prostate being rarely affected. In consequence, in the majority of cases where operation is necessary, orchidectomy is the one performed.

A kind of "halfway house" to orchidectomy has been suggested and practised by many surgeons; namely, epididimectomy, the removal of the epididymis. Such a proceeding sterilizes the gland by suppressing its external secretion, but it leaves the gland itself with its internal secretion. This seems very logical, but unfortunately by the time that the epididymis is so grossly diseased as to come to operation the body of the testicle is also affected. Also, the majority of the patients who come to operation are adults with fully developed male characters, in whom the internal secretion has done its main work. Therefore it seems a mistake to leave behind a diseased gland which is totally deprived of one function, the other being of little importance at that age. The field for epididymectomy must be a very small and restricted one. It would be very useful in children if their epididymes alone were diseased; as they would then develop and perfect their secondary sexual characters under the influence of the internal secretion. But unfortunately the epididymis often escapes in children, the testis itself being attacked.

An acute form of tuberculosis has been described comparable to "galloping consumption." It begins like gonorrhoeal epididymo-orchitis and rapidly spreads to the testicle, tunica vaginalis, spermatic cord, vesiculae, prostate, urethra and the rest of the genito-urinary tract; suppuration occurring within three weeks. The urethral discharge may contain tubercle bacilli. This form is very fatal, but is very rarely seen.

NEW GROWTHS OF THE TESTICLE

Clinically, these cases are divisible into malignant, benign and cystic tumours; under which headings they will be considered, the classification being more practical than if a purely pathological one had been adopted.

MALIGNANT TUMOURS

If the tumour arises from the epithelium, it is called a carcinoma; if it arises from the connective tissue, it is called a sarcoma. Of recent years it has been attempted to recognize as a distinct class of tumours those which have been derived from the endothelium and to call them endotheliomata. But as the endothelium has a connective tissue origin, it is natural that when actively growing, it should resemble and be largely indistinguishable from other young and growing connective tissue. Times are changing, and the epiblastic origin of all epithelium is no longer accepted; consequently young actively dividing epithelial cells may be practically indistinguishable as carcinomata from sarcomata. Formerly it was taught that sarcoma was found in the young and carcinoma in the old. But this statement has not stood the test of examination. Both classes of malignant tumours are most common over middle age, and both are occasionally found in the very young. A carcinoma of testicle has been found in a boy of five. Clinically these cases are peculiar amongst malignant tumours for the frequency with which some injury is given as the exciting cause. The process begins for choice in the body of the testicle; if rapidly growing, it is very painful on account of its compressing the testicular tissues within the tunica albuginea. If it grows slowly, the tunica albuginea stretches, even to several times the organ's natural size; the clinical course being painless. So long as the tunica albuginea is intact, the tumour retains the shape of the testis, suggesting the diagnosis of sarcocele or gummatous testicle which is so often made. The cases are not always so simple as described above. The pain is certainly dependent in great part on the testicular pressure, but it is not that pressure which alone bursts the tunica albuginea. The growth itself invades the tunica albuginea *so that some rapid growths are painless and insidious*. In fact, the practitioner may be called in on account of an abdominal tumour which is in reality a secondary growth. At least three such cases have passed under my personal notice. All were men of about thirty. The patient may only feel weight and dragging in the testicle, perhaps with occasionally neuralgic pains; so that if he has scruples, he is not compelled to seek advice for the condition. From the first the testicle enlarges and is usually firm or semifluctuating in its consistence. Pain is not always present at the beginning.

When the growth has burst through the tunica albuginea it may form an effusion of blood into the cavity of the tunica vaginalis, a haematocele, or infrequently a hydrocele. The absorption of the hydrocele is sometimes very misleading clinically, as it gives the impression that the tumour has decreased in size. The growth spreads along the spermatic cord, the invasion being greatest near the testis and thence fading off (Fig. 26). At times a definite nodule of growth is found along the cord, such as might result from the thrombosis of a lymphatic vessel.

It will sooner or later invade the skin of the scrotum, particularly from the epididymis, which has its posterior surface contiguous to the dartos. Sometimes, instead of forming a haematocele or hydrocele, the two layers of the tunica vaginalis become adherent to one another and the skin on the anterior part of the scrotum becomes involved. The skin then gives way and the growth protrudes, a fungus haematodes. If undisturbed in its course, malignant disease either kills the patient through the agency of secondary growths in the abdominal viscera, or less commonly through the pain and exhaustion of discharges from the scrotum.

The diagnosis is of the greatest importance. In its early stages malignant disease is purely local and curable. It will be most likely confounded with a gummatous testicle or some form of chronic

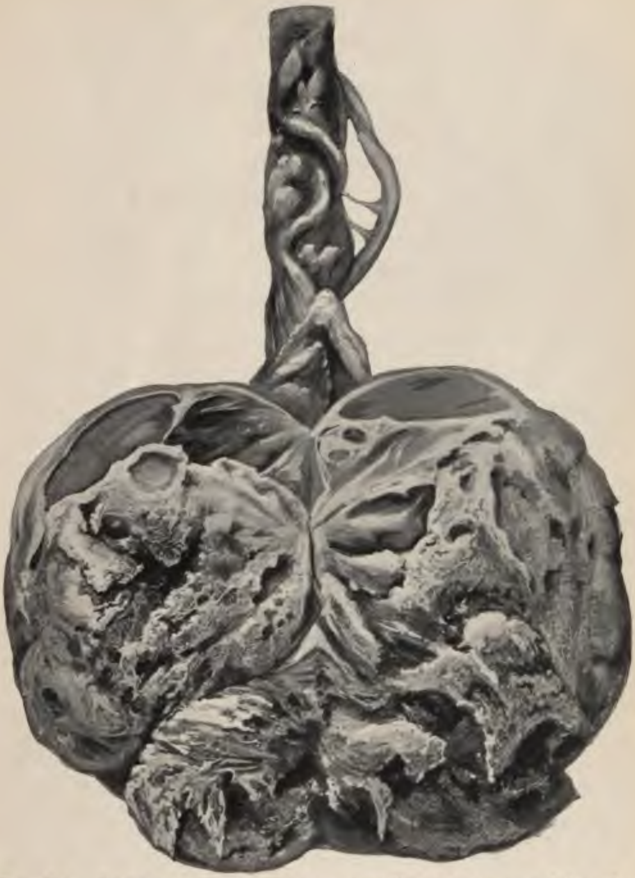


FIG. 24.—Specimen of Carcinomatous Testicle removed by the Author.

The cavities at the upper part of the specimen are parts of the tunica vaginalis. In the centre of the specimen the growth is undergoing septic necrosis, the consequence of tapping the tumour.

[*To face page* 156.

orchitis. Should tuberculosis begin in the body of the testicle, it too can be confused with malignant disease. Of the three chief things which affect the body of the testicle, malignant disease, gummata and chronic orchitis, the first two will give the greater trouble in the diagnosis. Steady increase in size with pain in spite of treatment indicate growth; painless swelling which diminishes under full doses of iodide of potassium does not. As the patient's only hope of life lies in the early and complete removal of the disease, time must not be spent in too prolonged a trial of medicinal treatment. A syphilitic testis, sufficiently diseased to approximate to malignant disease, will have had destroyed all, or nearly all, of its physiological value. Hence there need be no anxiety in risking its sacrifice. It will have occurred in the experience of most to see one of these tumours tapped in mistake for a hydrocele. A neoplasm bleeds freely, a gumma does not.

The treatment should consist of early and free removal of the disease. Modern research shows that malignant disease is primarily a local affection and can be cured by its early and sufficiently free removal. Unfortunately, in a very large number of cases the patient and the doctor only decide upon operation when there is no hope of cure, as is shown by the recurrences so often seen clinically. Thus the operation of castration, which differs from that of orchidectomy in the removal of the tunica vaginalis, spermatic cord, etc., is done in these cases for two reasons: firstly, in the hope of attaining cure; and secondly, if that is not possible, to save the patient from the pain and misery associated with the primary growth. It is infinitely easier for a man to die of secondary growths, even if they are distributed all over his body. Indeed, cases are well known where a man has worked for one, two or even three years, for the benefit of his family before being compelled to give up. In these cases the last illness is happily a short one. The glands in the groins are not usually involved unless the skin of the scrotum has become implicated. The disease extends *via* the spermatic veins, the deferential veins and the venae comites of the spermatic artery. As the three structures part company at the internal abdominal ring, it becomes useless in practice for the surgeon to attempt the removal of structures beyond this, such as a secondarily infected vesiculae. But by opening the inguinal canal, the surgeon is enabled in almost all cases to get above and remove the primary disease, so preventing local recurrence and, if it must be, allowing the patient to succumb, painlessly and gradually, from the distribution of generally internal growths.

BENIGN TUMOURS OF THE TESTICLE

Apart from cystic disease, benign tumours of the testicle are of rare occurrence. Tumours of one type of tissue are even still more infrequent. The tendency is for several types of tissue to be included in the tumour, the most common of which is cartilage. Mixed cartilaginous tumours are known in plenty; but pure chondromata are very rare. In these tumours a great and important question, apart from their scientific interest, rises from the patient's point of view. Like the corresponding tumours of the parotid it is very difficult for the pathologist and clinician to decide if they are malignant. The treatment of these tumours consists of early castration. Their enucleation is dangerous on account of their doubtful nature; whilst it is useless as the testicle will have lost its value through the compression and destruction of its tissues. The tumours commonly contain multiple cysts.

CYSTIC DISEASE OF THE TESTICLE

In cystic disease of the testicle, the cysts are always numerous and of the greatest variety of sizes. Their contents may be clear and limpid, or thick and glairy, colourless or yellow, white, curdy, yellow, brownish, or bloody. They exist in two classes of tumours: the benign, fibromata or chondromata; the malignant, sarcomata. Clinically, they are most frequent during active sexual life rather than earlier or later. They differ in their rate of growth, the amount of pain caused;

and the benign have a smooth surface, the malignant a bossy one. Otherwise these tumours cannot be differentiated from one another clinically. Under these circumstances early castration is the only treatment; *even if the tumour turns out to be simple, a gland, which has lost its value, will only have been removed with it.*

DERMOID CYSTS

Under this name are included certain cysts of congenital origin which contain epithelium, hairs, sebaceous material, bone, etc. Their exact origin is uncertain. Apparently they arise between the testis and the epididymis. Clinically, they remain quiescent for a long time, but, sooner or later, inflame and perhaps suppurate. They also tend to cause atrophy of the testicular tissue. Hence as soon as their presence is diagnosed they should be removed. Unfortunately, from their situation between the epididymis and testis, this operation will in all probability put an end to the external secretion of the gland by destruction of the vasa efferentia, the gland being sterilized. But inflammation of the cyst will do this for certain. So it seems better to remove the cyst than to incise and drain it. This latter treatment has been much advised. Enucleation should be attempted in subjects under twenty-three years of age.

CHAPTER IX

THE FUNCTIONAL AFFECTIONS

THE sexual function plays a very large part in every human life, and is in consequence subject to many disturbances in its operation. These form far too large a subject to be treated in this small work, so that it has been necessary to select which to mention. It was decided to include short articles upon Spermatorrhoea, Sexual Abuse and Excess, Impotence and Sterility, and also a brief account of the relation of the Intellectual to the Sexual life, as it is a point on which many seek enlightenment.

SPERMATORRHOEA

Spermatorrhoea is a name given to the involuntary discharge of semen at improper times. Most commonly it happens whilst the subject is straining at stool, the vesiculae being emptied at the same time as the rectum. It is a condition usually found in the incontinent, whether the result of self or sexual abuse, who suffer from general feebleness of health, body, mind and will. It is not infrequently met with in healthier men who have contracted gonorrhoea and in whom the vesiculae have been infected. In them, the vesiculae are relaxed, dilated and easily palpable per rectum. Indeed, it is sometimes possible to express fluid from them. In the former class, the vesiculae are also dilated, with the addition of a moist, relaxed scrotum and general lax habit of body. These two classes are made up of men on the younger side of middle life and form the only ones in which the condition is likely to be found.

With regard to the fluid ejected it is commonly that secreted by the prostate or vesiculae themselves and does not contain spermatozoa. The ejection of the fluid is no disease in itself, but merely a symptom either of sexual neurasthenia or an infective dilatation of the vesiculae. In itself it is not likely to do much harm except to the mind of the sufferer, whose depressed condition is too often increased by reading quack literature and listening to the silly stories of friends. Treatment is usually quite satisfactory if the patient's mental condition will allow it to be carried out.

The patient should always be taught to make cover-slip preparations of the fluid ejaculated (*see* pp. 33, 34), which are subsequently stained and examined for the presence of spermatozoa, gonococci and other organisms.

The treatment for all neurasthenic conditions, whether sexual or otherwise, is "rest." In one class of sufferers from spermatorrhoea, the condition is a symptom of sexual neurasthenia, the treatment of which will be considered first. Above all things there must be complete sexual rest and continence for mind and body. The manner of life must be adapted to this end, and at all times the patient must not "parley with temptation." The mind must be brightened with fresh work, interests and habits ; perhaps change of scene, such as travelling or a voyage. The treatment of the body is a mere adjuvant to that of the mind. The best plan is to map out the day ; early rising, cold bath with local douching, exercise, breakfast, work, lunch, work, tea, exercise, dinner, reading or other cleanly and healthy occupation, early to bed. The greatest practical difficulty is to provide sufficient variety for those who cannot afford to pay for it. The general bodily health is improved by tonics and exercise. But it is unwise to begin stimulating medicinal treatment until the mind has improved. The mattress should be firm or hard, and the clothing sufficient for the time of year. Open air treatment is excellent.

If really despondent and melancholic, the patient must be put to bed and undergo more or less complete Weir Mitchell treatment.

The treatment of the post-gonorrhoeal spermatorrhoea consists in improving the general bodily health by outdoor exercise, coverslip preparations of the fluid being examined from time to time.

In every case, a careful examination should be made for some local cause of irritation, which if found should be removed.

SEXUAL ABUSE AND EXCESS

The words "sexual abuse" have been adopted to replace the more usual one of masturbation, whilst it includes excess or over-indulgence in coitus. It cannot but be borne in upon one that in itself the habit of masturbation is not responsible for one tithe of the troubles attributed to it. Further, it is not the conduct or performance of the habit, so much as its excess or abuse, which constitutes the evil. The modern age for marriage in the professional classes is upwards of thirty, whilst the age of puberty can be roughly stated as fifteen. Yet Nature cannot mean that the ripened functions should lie fallow all that time, fifteen years, which in the case of a woman is equivalent to half her sexual life. Much as the habit of masturbation is to be controlled, corrected and deplored, it is probably an evil which has resulted in great part from our social evolution. The exercise of the sexual functions, after the age of puberty has been attained, is physiological to the organism. Its abuse, such as its excessive indulgence, is pathological. In boys, masturbation in excess can do as much harm as excessive coitus in the older. But it is not so much the act as the excess or abuse which constitutes the evil. Masturbation, when practised before puberty, is most harmful, not only to the mind and body but to the development of the sexual glands themselves. It is reasonably certain that the precocious stimulation of immature glands in corresponding degree inhibits their future development or maturation. Thus precocious sexual stimulation does lead to imperfect bilateral development of the testicles when puberty arrives. If practised after puberty and without excess, there is little reason to believe that harm results to the individual. The disgust excited by the habit has undoubtedly blinded the judgment of many who have written about it. Nevertheless, as in other things, there is a "soul of good in things evil," and some patients have asserted that the practice of the habit in moderation has been beneficial to their health and work.

There is reason to believe that nearly as much harm may result to those who indulge in excessive coitus as to those who indulge in excess of masturbation. There is one great difference; the former have usually fully developed minds and bodies, whilst the latter have not; and it is the imperfectly developed who suffer most. The temperaments of all are not constituted similarly, so that the excess will react differently on each; one becoming brilliant and witty, another dull, taciturn, hesitating or timid.

It is not necessary to give at length the signs and symptoms to be found in the general, muscular and nervous systems of those who are addicted to sexual excesses. Rather is it of advantage to proceed straight to treatment. The treatment must be medical and moral. The medical consists in looking for sources of local irritation, such as a long prepuce, and removing them. This must be followed by a general ordering of the day. The bladder must be emptied immediately on waking, a cold bath should be taken immediately on rising, all meals should be plain and plentiful, whilst the rest of the day must be filled ingeniously with work, play and relaxation. The boy should be encouraged by kindness, not discouraged with severity.

The moral treatment consists of guarding and guiding his ways of life, and, if he is old enough, in pointing out the relations, evils and results of the habit. The kindly man of the world is of much more use in treating these cases than the austere cleric. As the boy grows older his mind will become more and more occupied with interests, such as of his work or play, and the sexual apparatus will not be so frequently obtruded on him. Unless the people become cured and healthy as age advances they may become "sexual hypochondriacs," who see impotence in a varicocele and ruin in an emission. The older these hypochondriacs, the less the chance of cure.

IMPOTENCE AND STERILITY

Regarded from the point of view of the race, the successful performance of the sexual act requires two things, potency and fertility. If either factor fails, the race cannot be propagated. The more important of the two factors is the second; the presence of the seed, which constitutes masculine fertility. The degree of potency required may be very small in order to impregnate the female.

By **impotence** is understood inability to perform the sexual act. Its causation is anatomical, pathological, physiological and psychological. In other words the deficiency may be in the parts, in diseases, in the functions or in the mind. Of the anatomical may be mentioned defects and deformities of the penis. Of the pathological may be mentioned prolonged diabetes, albuminuria, disease of the brain and spinal cord. Of the physiological may be mentioned imperfect erections, premature ejaculation. The lumbar sexual centre is subject to the same functional diseases, such as are known elsewhere as stammering bladder and enuresis. Of the psychological causes may be mentioned the obtrusion of disorderly ideas, of lack of confidence, fear, repugnance, etc.

The treatment must be directed to the cause, which, if anatomical or pathological, is frequently irremediable. For the physiological and psychological causes, sexual rest is the first desideratum. When it has been obtained, further treatment can be begun. The symptoms, such as emissions or spermatorrhoea, must be treated by regulation of the order of life and diet. Tonics such as strychnine, iron and quinine can be used. Drug habits must be sought for and broken. Finally, when nervous tone has been restored, the matter can be quietly discussed with the patient, encouraging him to allow sexual matters to take their course, quietly and without notice on his part. No patient is cured until his mind has become interested in some hobby or occupation.

Impotence is an acquired character in the great majority of cases, and is the incapacity to perform the act of coitus. By **infertility or sterility** is meant inability to procreate, a character which may or may not be associated with impotence. Many acquired infertile or sterile males are perfectly potent.

The fact that a married couple do not beget children does not necessarily imply that one of them, at least, is sterile. It is well known that some unions are unproductive *per se*. The fault may be on either side, and it is a great mistake to assume that the fault is with the female. With that side of the question we have here no concern. The first question is to ascertain if the male is potent, which can be settled in a question or two. The second question is, Is the semen fertile? To ascertain this it is desirable on one or two occasions to examine the semen for spermatozoa. This is at the beginning rather difficult, as it is the semen ejaculated during sexual excitement which is best for examination. It can either be done from an examination of the fluid discharged in an emission; or, better, that ejaculated during coitus. Coverslip preparations are then made, and if spermatozoa are found no further examination is required. A potent male whose semen contains spermatozoa can impregnate a female. On the other hand if no spermatozoa are found after more than one examination the genitalia should be examined. Masculine infertility can arise in two ways, congenitally and by acquisition.

Congenital Infertility.—The testicles may be imperfectly developed or even absent. Or there may be some congenital stenosis or absence of the vas deferens or vesiculae. In order to cause infertility, the lesion must be bilateral, as there is ample evidence to show that one testicle is sufficient to ensure procreation. Imperfect development of the testicles is almost always accompanied by imperfect descent of the glands. Clinically, the want of descent is more easily recognized than the want of development. Even in its worst degrees, the abdominal testicles of cryptorchids, cases are known in which the subjects thereof were fertile. Fertility is certainly rare in them, but it may occur; and when it does, it is delayed until twenty to twenty-two years of age, and lasts one, two or three years. So that if there is a question of the begetting of an heir, the opportunity in these years should not be allowed to pass by. Congenital infertility is associated with bilateral defects and deformities of the testicles, the vesiculae seminales and their ducts.

Acquired Infertility.— This subject can be considered best at the various ages in which it may be acquired.

(*a*) *In the Young.*—Before puberty, the development and even the atrophy may be caused by attacks of inflammation in the gland, such as after an injury or a specific fever. Of the latter, mumps or parotitis is the worst. But fortunately in both these cases the lesion is usually, if not always, unilateral; whilst a bilateral one is requisite to bring about infertility. Tuberculous disease unfortunately is prone to affect the epididymes; and if bilateral, will probably sterilize the patient. Syphilitic disease acts differently in preventing the development of the body of the gland, the testis, and therefore by no means so certainly sterilizes the patient as tubercle does which affects the epididymis. It is like blocking a door instead of having to fill up the entire room.

It is doubtful if any but the most excessive and precocious masturbator can sterilize himself by the practice.

In conclusion, I must refer the reader to the section on the influence of inflammation on the subsequent growth and maturation of the testicle (pp. 86–87).

(*b*) *In the Middle Phase of Life.*—The most frequent cause of acquired infertility at this period is undoubtedly very chronic epididymitis, which is recognized clinically as a hard nodule in each globus minor or cauda epididymis. Tuberculous disease of epididymis is another factor. But next common to a chronic epididymitis is an urethral stricture which maintains the posterior urethras, the vesiculae seminales and vasa deferentia in a state of chronic inflammation, preventing the natural secretion and causing the ciliated epithelium to be shed.

(*c*) *In Old Age.*—The changes in the prostate in later life, if they occur, are practically two, enlargement and diminution ; leaving their causation studiously alone. They act by obstructing the ducts of the vesiculae seminales, which become chronically enlarged and inflamed in consequence, the infective changes slowly advancing up the vasa deferentia to the epididymes. Post-operatively, cases of prostatectomy are very interesting from a sexual point of view. For instance, one man had his prostate removed when the ejaculatory ducts were torn across, and a large abscess in each testicle formed (? amount of destruction caused in the glands); although subsequently he ejaculated no semen, he was perfectly potent, and even felt his power increased at the age of seventy to seventy-five.

Quite apart from these prostatic changes of advancing years, there is undoubtedly a physiological decline in both potence and fertility. Examples of paternity in advanced years are certainly well known, but it has yet to be shown to be the rule and not the exception.

There remains to be considered a peculiar form in which fertility is associated with impotence due to some anatomical deformity, such as severe hypopadias or epispadias, which renders copulation impossible, so that the fertile semen cannot be brought to impregnate the female. This does not often crop up, as intromission is merely an adjuvant, not a necessity, to impregnation.

In practice the question of infertility most frequently presents itself in one of two forms; either in a man about to marry who is fearful of the effects of his past; or in a married man, who, though sexually potent, has no family. The former case is easily examined and decided. In the latter, the fault may be the husband's or the wife's; the usual practice is to commence by examining the wife. But as there is no possibility of proving in her the existence of a seed, such as the spermatozoa of the man, I would strongly advise that the husband be the first to be examined. The inquiry is more easily conducted, and can be carried out quietly and without distressing the wife.

THE RELATION OF THE INTELLECTUAL TO THE SEXUAL LIFE

It is a very popular idea that the sexual power is correlated or even commensurate with the intellectual, the decline of the one being accompanied by the decay of the other. The evidence on which this assumption rests is an imperfect survey of various prominent characters in history, science, literature and criminology. But the subject is very imperfectly understood. Every particular man has only a certain supply of energy : if one man uses up that energy in one direction there will be little left to be used in others ; on the other hand, a man of abounding energy is likely to show it in all directions. The **direction** in which the energy shows itself seems to a great extent to be acquired by means of the influences of surroundings and of education. The **supply** of energy seems to a great extent to be an inherent or a congenital characteristic. Thus the sexual life is a very unreliable index of the intellectual life; although one can safely say that he who is possessed of little or no energy will display little or none in everything he does. The degree of testicular development is a very subsidiary factor. The mainspring of sexual, as of other energy, lies in the central nervous system and not in the generative organs; they are merely the works by means of which the mainspring of energy in the central nervous system makes the sexual clock or mechanism go. Hence with all declines of nervous energy, such as in illness or neurasthenia, the sexual power must decline *pari passu*. It has been stated that the performance of the sexual act requires the delicate co-ordination of many sets of impulses. In consequence of the delicacy of this complicated system, the co-ordination of the many impulses is easily thrown out of gear, and the subject becomes upset at his inability to exercise the most important function in the life of a living organism. Hence in all illness the sexual power is affected early, and is one of the last possessions to return during convalescence. It also becomes easy to understand that those whose minds become depressed, and perhaps find a varicocele present, quickly find real concern in their loss of sexual power. In the less intellectual and therefore the more animal, the sexual centres in the spinal cord have little or no controlling action from the higher centres, and may exhibit a kind of exaggerated action, a symptom of what may be termed "moral spasticity." To put it briefly, the health and condition of an individual is often reflected in his sexual life. It is the consequence of this that there are so many patients who are troubled about the functions of their generative system. It is necessary to convince them that their sexual condition is *not* the real trouble which afflicts them. It is merely the outward and visible sign of the inward and invisible condition, which depresses the nervous system. In consequence treatment must be directed to the nervous, not to the generative, system.

CHAPTER X

DISEASES OF THE SPERMATIC CORD

THE spermatic cord is a composite structure, being made up of many parts—the vas deferens and its vessels, the spermatic artery, the pampiniform plexus, the cremaster muscle, nerves, lymphatics, and connective tissue which is continuous with that of the subperitoneal tissue above and that of the scrotum below. Besides these there may be the remains of the but partially obliterated processus vaginalis present. To consider all its diseases is a great task, so it will be better to mention only the more important ones under their particular headings.

THE VAS DEFERENS

The vas is a long duct, lined by a mucous membrane and surrounded by muscular layers like the intestine, which connects the lower part of the epididymis, the cauda or globus minor, with the vesicula seminalis of the same side. In its course it traverses the inguinal canal, and its function is to convey the external secretion of the testis to its vesicula seminalis, where it is stored until required.

Injury.—The vas is rarely ruptured subcutaneously; in fact the most frequent accident from which it suffers is transverse division inflicted during the performance of such an operation as that for the radical cure of a hernia. Reference has been made to this subject when considering the influence of division of the vas deferens upon the testicles of the child and the adult (pp. 83–86). There are no local signs of division of the vas, the concomitant injury to the spermatic cord hiding any that there might be. Those authors who have recorded such cases refer to haemorrhage from the urethra as a sign of rupture of the vas, and consider that such an accident might be mistaken for a rupture, probably partial, of the urethra. Although I have seen the vas injured at the time of operation, both in my own practice and that of others, the symptom of bleeding from the urethra has never been seen by me. One man who had a seminal emission a few days after the operation drew attention to the brown colour of the stain. Thus, unless inflicted at an operation, division of

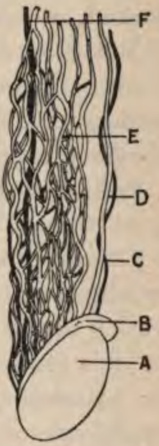


FIG. 25. — The Structures of the Spermatic Cord.

A The testis.
B The epididymis.
C The deferential artery; the veins are omitted.
D The vas deferens.
E The pampiniform plexus of the spermatic veins.
F The spermatic artery.
The nerves and lymphatics are not shown in the figure.

the vas deferens is hardly likely to be diagnosed. If it is diagnosed, operation should be undertaken and the ruptured ends exposed, prepared and united, as has been described on p. 85. If this is not done the ends become sealed by cicatricial tissue; the testis losing its external secretion, later undergoing fatty degeneration, and its vesicula slowly atrophies.

Inflammation or Vasitis.—The vas never undergoes primary inflammation; it is always secondary to some infection elsewhere; generally from the urethra, less frequently from the epididymis. Acute vasitis occurs as a concomitant of acute gonorrhoea, or as a sequence to urethral infection by operation or instrumentation; it is usually accompanied by epididymo-orchitis. It is recognized by the tender, thickened and swollen condition of the duct. Resolution is the almost invariable end, though suppuration is not unknown. Clinically, it is a mere item in a widespread infection, and demands no more special treatment than the occasional use of an icebag. **Chronic Vasitis** is by far most frequent in the portion nearest the epididymis, where it may constitute a part of the subacute or chronic fibrosis, usually called chronic epididymitis.

Stricture of the Vas.—This is almost always the result of the chronic vasitis associated with chronic epididymitis. Its importance is twofold: it can confer sterility or infertility; and by its slow

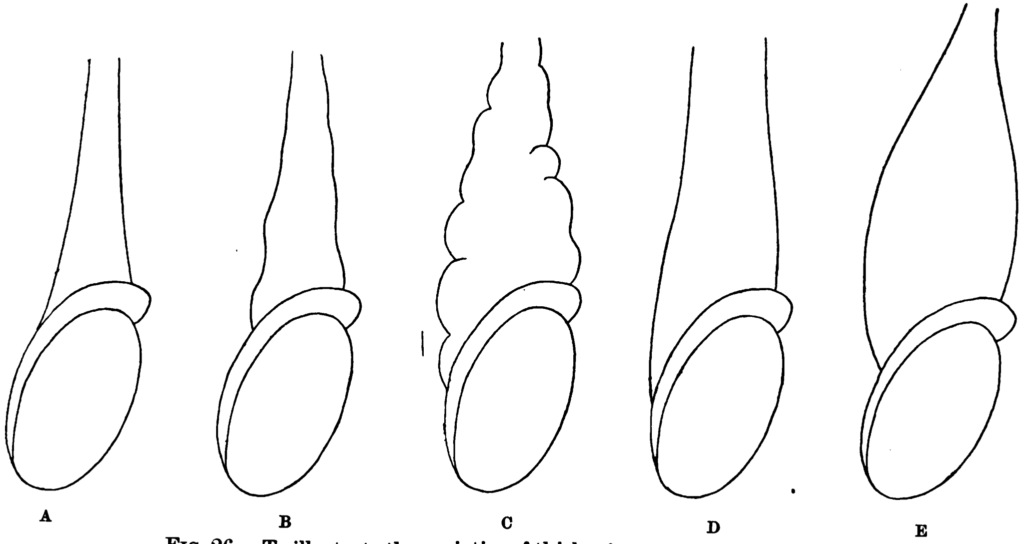


FIG. 26.—To illustrate the varieties of thickening of the Spermatic Cord.

A Normal testicle and cord.
B Early stage of thickening of cord in tuberculosis. Two nodular swellings represented as discrete.
C Advanced stage of tuberculosis. Many nodules, at first discrete, are now more or less confluent.
D Uniform (in contradistinction to the nodular enlargements of tuberculosis) thickening of the cord in syphilis due to the weight of the sarcocele.
E In malignant disease of the testicle the thickening is greatest just above the testicle, becoming less as it ascends the cord.

action can destroy the physiological value of the testis and perhaps cause the formation of spermatoceles. It affects the vas close to the epididymitis, and may perhaps be part of a chronic epididymitis (*see* pp. 129–131).

Tuberculosis of the Vas.—This may occur as an incident in general miliary tuberculosis, when it is of no importance. It is never a primary affection, almost always resulting either from infection from the epididymis or the vesicula. The part most often affected is that which forms the last two to three inches adjoining the epididymis. It takes the clinical form of nodular thickenings along the vas. These nodules run the same clinical course such as may be run by tubercles elsewhere (*see* pp. 141–154). They rarely require special treatment, taking their part in that of the testicle. Occasionally it is necessary to open and scrape them, but the consequent stricture of the vas must always raise the question as to whether it would not be better to save the patient by castration from the danger and distress of a diseased testicle, which must become functionless later.

Syphilitic Disease of the Vas.—In secondary syphilis, particularly in connexion with the epididymitis of this phase of the disease, the vas may become swollen and tender. Like all secondary affections it is transient, subacute, often symmetrical, and yields to treatment with mercury. In tertiary syphilis the vas can be felt to be harder and thickened. In all probability it is mere fibrous thickening on account of the weight of the heavy gummatous testicle or sarcocele which it has to support. Hence the thickening which is uniform along the cord is not syphilitic; it is never seen apart from a heavy testicle. Very rarely gummata are found along it. Their cicatrization will probably produce stenosis of the duct.

The vas has not been known to be affected in congenital syphilis.

Malignant Disease of the Vas.—Primary malignant disease of the vas, both sarcoma and carcinoma, is exceedingly rare. Malignant disease secondary to that of the testicle is much more common, and can be seen in every case in which the disease of the testicle is allowed to progress. It is much less common for the other end of the vas to be affected secondarily to disease of the vesiculae or prostate.

Anomalous Descent of the Vas Deferens and Spermatic Cord.—When the testicle descends imperfectly, of course the vas and cord are likewise affected; such is not meant in this paragraph. But cases are referred to in which, though the testicle is imperfectly descended, the spermatic cord has done so more fully, so that it hangs as a loop in the scrotum. Cases of this have been recorded from time to time, in which the loop can be distinctly felt through the scrotum by means of the whipcord-like sensation imparted by the vas. If observations are made at the operations for imperfectly descended testicle all varieties of this loop-like descent of the cord can be seen, from a slight curve with its convexity at the top of the scrotum or by the spine of the pubis, to when it descends fully into the scrotum, so that clinically the vas can be felt making the two limbs to the U-curve. This descent of the vas deferens is correlated clinically with torsion of the cord, and, if its presence can be ascertained clinically, it is an indication for operation. In these cases the testicle can be easily freed and fixed in the scrotum-orchidopexy.

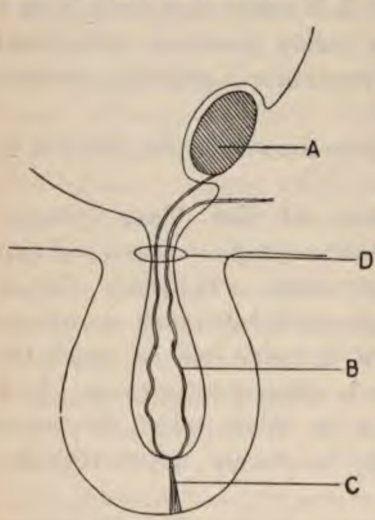


FIG. 27.—To illustrate the Anomalous Descent of the Cord

A An abdominally retained testicle.
B B The limbs of the descended or scrotal loop of the vas deferens.
C The gubernaculum.
D The inguinal canal.

The improper descent of the cord is produced apparently by the attachment of the gubernaculum to the testicle being irregular and having a firmer hold of the vas than of the testicle itself.

Very rarely two testicles are found in one side of the scrotum, a condition sometimes spoken of as **Transverse ectopy.**

HYDROCELES OF THE CORD

A hydrocele of the cord is a cavity containing clear and translucent fluid, which is situated amongst the structures of the cord. There are three fairly frequent varieties and some rare ones. The former will be considered in order of their frequency.

THE TUBULAR HYDROCELE OF THE CORD

In the descent of the testicle the gland is preceded by a process of peritoneum, which in due course should be shut off from the peritoneal cavity and from the tunica vaginalis. This closure is affected at birth in far the greater number of babies, but instances are often seen in which it is not (Fig. 12). The more fully descended the testicle, the more will the communication between the tunica vaginalis be drawn out to form a neck. This neck is called the processus vaginalis, and it becomes more and more marked and contracted as development proceeds (Fig. 28). The processus is thus defined. This tubular process does not fill itself with fluid, but is filled either from above or from below. In the former case the fluid comes from the abdomen, and is responsible for almost every case of tubular hydrocele of the cord. The fluid is formed as the result of gastro-intestinal fermentation.[1] Its presence may be detected as a thickening of the cord on one side as compared with that of the other, with the presence of clear fluid in the tunica vaginalis. The condition is one which is seen daily at large children's hospitals.

If the tubular processus vaginalis fills from below upwards, it is almost certain to be due to some disease of the testicle or tuberculosis of the tunica vaginalis.

Treatment must be directed in the former class of case to the gastro-intestinal and not to the scrotal condition. Attention must be paid to the diet and powders of mercury, and chalk, or better rhubarb and soda, must be given twice daily. It takes some little time to restore the proper functions to the child's intestinal tract, but as

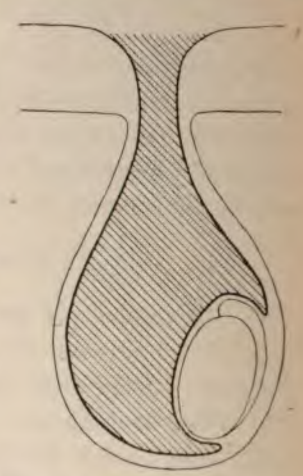


FIG. 28.—A Tubular Hydrocele. Processus vaginalis filled with fluid.

---

[1] "Some Surgical Results of Improper Feeding," *Clinical Journal*, XXVIII., pp. 171–176.

this is being done the fluid in the hydrocele will be absorbed.

Should the presence of the fluid persist, the practitioner naturally begins to doubt the correctness of the diagnosis. But it must be remembered that chronic inflammation of a serous membrane impairs its powers of absorption. The non-absorption of the fluid, clinically, soon calls for operative procedures to remove it, to see that there is no disease of the testicle and to cure the hydrocele. This is done best through an inguinal incision, the inguinal canal being opened as in a hernia operation, the processus vaginalis seized and freed with dissecting forceps from the structures of the cord, divided, and its abdominal end transfixed and ligatured. The scrotal end is then slit up until the tunica vaginalis is freely opened; care must be exercised to avoid dividing any structures of the cord which may be twisted spirally round the processus vaginalis. The testicle is then drawn into the wound and examined: if diseased, it is treated accordingly; if not, the tunica vaginalis is further split up and may be turned inside out and fastened in this position by a single stitch. This last step is usually unnecessary. As much care must be taken to avoid injuring the structures of the cord as is advised in hernia operations (pp. 73–74).

ENCYSTED HYDROCELE OF THE CORD

In this form, the fluid is contained in one or several cysts, which have resulted from the separation of the processus vaginalis from the peritoneum above and the tunica vaginalis below, with the imperfect obliteration of the canal of the processus itself (Fig. 12). Being congenital they are most frequently seen in the young, and on the right side, as it is later to become obliterated, than the left. Often they do not become noticeable until puberty, when the genitalia begin to grow and develop. Clinically, they form movable translucent cysts, which can be made to disappear into the inguinal canal, have but a very slight impulse on coughing, such as is possessed by all structures of the cord, and is separate from the testicle. The danger of leaving it, is the subsequent "growth-dilatation" of the inguinal

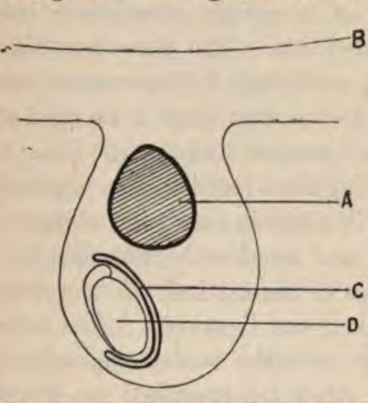


FIG. 29.—An Encysted Hydrocele of Cord which is formed from an obliterated processus vaginalis, which has become shut off from the peritoneum above and the tunica vaginalis below.

A The encysted hydrocele of cord.
B The peritoneum.
C The tunica vaginalis.
D The testicle.

canal and the formation of the hernia (*see* pp. 54–57).

Treatment by tapping and injection may be tried, and is often successful. The cyst is squeezed with the forefinger and thumb into the upper part of the scrotum, where the skin is made tense over it. A trocar and canula are then thrust sharply into it and the fluid evacuated. Through the canula a few minims of pure carbolic are injected through a syringe, and the cyst lightly massaged. The patient experiences a feeling of local warmth, but soon loses it owing to the anaesthetic action of the carbolic. If this fails or operation is preferred, the cyst is excised through an inguinal incision; the inguinal canal being opened and sutured when desirable.

THE HYDROCELE OF A HERNIAL SAC

In these cases the fluid is contained in a hernial sac (Figs. 10 and 11), to which it obtains admission from above either as part of the exudation of the gastro-enteritis of children, tuberculous peritonitis, cirrhosis or any form of ascites. Or it may be of local formation, as in subacute or chronic inflammation of the hernial sac, its tuberculosis, etc. The hydrocele may communicate with the abdomen, but, generally, it has completely or partially lost this on account of three agencies—the adhesion of a plug of omentum in the mouth of the sac, inflammation about the neck of the sac, peritoneal adhesions within the neck of the sac. Recently I came across a case in the inguinal hernia of a lady in which the neck was obliterated with straw coloured cysts which were due to the inflammation and adhesion of the fimbriae of the fallopian tube in this situation. She had had the hernia for many years, then it disappeared, and she had a ventral fixation of the uterus done, after which the hernia reappeared and became irreducible, the hydrocele of the hernia sac.

The clinical points to be relied on are—the history of the presence of a hernia, the presence of a fluid, translucent swelling connected with the abdomen, none but a heaving transmitted impulse on coughing, the absence of symptoms of the strangulation of a hernia. The connexion of the swelling with the abdomen can be ascertained by its extending through the hernial aperture. This is easy to prove in inguinal herniae, but may be extremely difficult in femoral herniae.

Operation must always be advised, because it is impossible to exclude the presence of some strangulated structure, which is not bowel, in the neck of the sac. In rare cases a partial enterocele or Richter's hernia has occluded the communication (Fig. 11). This is more frequently seen in the acuter forms, and will always be accompanied by the symptoms of incomplete intestinal obstruction. Fluid is always found in the sac of a strangulated hernia, but it plays such an insignificant part that it is better not to introduce it under the name of acute hydrocele of a hernia sac.

Besides these three forms of hydrocele of the cord there are a few more which are not often seen. A serous cyst sometimes forms within a lymphatic space of the connective tissue of the cord. Occasionally a cyst of the epididymis, having grown larger, loses its attachment to that structure and becomes dislocated upwards. Yet another example may be quoted, the historical diffuse hydrocele of the cord, which has only twice been seen.

HAEMATOCELE OF THE CORD

A haematocele of the cord is the result of the haemorrhage in one of the situations of the hydroceles which have been described, but their frequency is in the inverse order. For instance, diffuse hydrocele of the cord is the rarest, but **diffuse haematocele of the cord** is the most frequent. It results from a blow or injury. The blood is diffused throughout the cord. The diagnosis is obvious, though it is impossible to exclude the possibility of injuries to other structures of the cord underlying it, such as rupture of the vas deferens, a vein or veins of the pampiniform plexus, etc.

A Haematocele of a Hernial Sac is not uncommon if the reader chooses to include under that term the bloody serum so commonly seen in the sacs of strangulated herniae. A true haematocele of a hernial sac is by no means so uncommon. The author has only met with one case, and as that was the result of a truss injury in the femoral hernia of a woman, it does not come within the scope of this work.

An Encysted Haematocele of the Cord is exceedingly rarely produced by a haemorrhage into the cavity of an encysted hydrocele of the cord. When found it is always the result of a local injury or the remains of a diffuse haematocele, all of which has resolved except the encysted portion. It is more comparable to a haemorrhage into a serous cyst of the cord than into an encysted hydrocele.

I know of no case of a **Tubular Haematocele** of the cord, though such is possible if one cares to include under that denomination the bloody fluid which might be present if a viscus was strangulated at the top of a total congenital hernial sac.

At their formation haematoceles should be treated with rest and an icebag. If the tension becomes great and painful it indicates that a large vessel is bleeding, and that it is best to make a free incision, find the bleeding point, and ligature it. Otherwise, the haematocele may resolve. Should it persist, it must either be tapped, or, better, incised. Excision, on account of the fact that the cyst has no true capsule and is in direct continuity with the surrounding tissues, is not always a neat or satisfactory operation.

THE SPERMATIC ARTERY

Injury or rupture of this artery is a rare event, apart from the operation of varicocele, when it is immediately and properly treated. But the author has had the opportunity of seeing some cases in which it has been injured and has led to important clinical symptoms. The first was in a feeble old man supposed to be the subject of a huge thoracic aneurysm. He had a strangulated hernia which demanded operation. The operation was done hurriedly, the man getting progressively worse throughout, and dying about two hours later. The aneurysm was naturally thought to be responsible for the result. But the postmortem showed that this was not so. The spermatic artery had been cut, doubtless in removing the sac, and had retracted when the first ligature round the neck of the sac was broken. It then formed a haematoma on the surface of the psoas muscle, which grew and finally burst through the peritoneum, the man dying of intraperitoneal haemorrhage. This case is remarkably instructive, as it emphasizes the care which should be taken, even in such urgent and hurried operations, to cleanly free the neck of the sac before its ligature; the ligature itself must be skilfully tied and not broken, or the artery may retract a long way, and, after bleeding extraperitoneally, may finally bleed intraperitoneally and kill the patient.

Such a case must be exceedingly rare, as it is very uncommon to get such a dire combination of medical, surgical and personal disasters. In another case, when the artery had been divided in removing a varicocele, a ligature was broken when tying the upper stump. This allowed the vessel to retract, and shortly after the patient's return to the ward he presented all the signs of internal haemorrhage. His abdomen was opened, found full of blood, which came from a ragged opening in the peritoneum over a haematoma on the surface of the psoas. This had been caused by the retraction of the cut spermatic artery, which was ligatured, and the boy recovered. In two other cases, one after the operation for varicocele and one after the removal of a varicocele in the course of a hernia operation, I have seen the patients complain of an abnormal amount of pain accompanied by some rise of temperature; the wounds were perfectly clean. A few days later a rounded swelling was apparent in the iliac fossa, which became more obvious and easily handled as time elapsed. It was undoubtedly a haematoma over the psoas, caused I believe by the retraction of a cut spermatic artery; the non-fatal result being because the haemorrhage was extraperitoneal. Had that membrane given way the bleeding would have taken place much more easily and freely into the peritoneal cavity, producing a fatal ending unless prevented by energetic surgical measures.

These cases show that the artery may retract a long way into the abdomen and at the same time not close its open mouth. Under these circumstances injuries of the spermatic artery may call for the highest surgical skill and judgment. It is noteworthy that at none of these operations was there any suspicion that such an accident had occurred.

THE SPERMATIC VEINS

Phlebitis and Thrombosis.—Inflammation of the pampiniform plexus is not a frequent occurrence, though every one will have seen a number of cases of it. The phlebitis is always followed by thrombosis. The cord becomes tender and swollen, a hydrocele forms in the tunica vaginalis, the scrotum and dartos become thickened and oedematous, the testis becomes enlarged, painful, and even inflamed, orchitis. The inflammation and thrombosis of the veins are always due to the action of some micro-organisms, except, perhaps, in the case of injury, and even then it is probable that organisms are present. Injury is the most frequent cause of thrombosis of the pampiniform plexus. But it may follow on influenza, gout, rheumatism, typhoid and other specific fevers, etc. The process almost invariably resolves, very rarely proceeding to suppuration. It takes four to six weeks to resolve, but the patient will be able to get about with a suspender before then. It begins with pain, often of a dragging sickening character, and swelling in the part, accompanied by a slight rise of temperature and other constitutional disturbances. The patient, besides complaining of pain locally, frequently refers it to his abdomen. As long as he rests he is easy. He must be put to bed when possible, and ice or heat applied as seems desirable. The bowels should be freely opened. After a few days the patient will be able to get about, using a suspender. But he must be warned against standing too much, and must sit, or, better, lie down, as much as he can. An attack of thrombosis usually resolves, but in young men and youths the testicle commonly ascends to the upper part of the scrotum into a position of **acquired imperfect descent.** At the same time it becomes smaller and painful; sometimes it enlarges at first. It may take upwards of two years to descend again; it never regains its original size, and occasionally it becomes painful and neuralgic.

VARICOCELE

A varicocele is a dilated and tortuous condition of the lengthened and enlarged veins of the pampiniform plexus. The veins begin in the blood spaces beneath the tunica albuginea of the testis, join with veins from the epididymis, later with radicles from the dorsal vein of the penis and from the external and internal pudic veins. In the inguinal canal they join up to form two or three trunks, which in their turn join up later to form one vein. The vein of the right side enters the inferior vena cava ; that of the left joins at right angles one of the renal veins and at the same time receives branches from the descending colon and, perhaps, the sigmoid. Frequently, the pampiniform plexus also communicates with the vena cava by means of venae comites which accompany the spermatic artery.

Varicocele is a condition which appears, or makes its presence felt, about the period of puberty and early manhood. Between 80 and 90 per cent. occur before twenty five years of age. After middle life they disappear and are rarely seen in old men. That the presence of a varicocele is dependent on the sexual activity of the testicle is proved by its practical disappearance when that gland atrophies, as after the orchitis of mumps. Hence there is some ground for correlating the enlargement of the pampiniform plexus with the physiological activity of the gland. This is borne out by the frequency of the disease at the period of early adult life. That it is so constantly found on the left side must be correlated with the physiological peculiarities of that side ; such as the special anatomical features already referred to, which are sufficient to form a varicocele on the left side, whilst the veins on the right merely grow sufficiently for the needs of the gland. In its causation and origin, varicocele is not single and simple but complex and compound. There is no doubt that when operating on the inguinal canals of babies, both right and left sides, miniature varicoceles are often found. In such cases the anatomical peculiarities of the left side make a varicocele on the left side, when the testicles developed at puberty; whilst the growth of veins on the right does not proceed beyond the demands of the physiological requirements of the testicle.

As years pass by the varicocele tends to disappear spontaneously. The chronic venous congestion, which it causes, has a deleterious action upon the left testicle, which may interfere with its full development and later, as the result of fibrosis, lead to its atrophy. Such atrophy takes place when the usual time of life has passed by for the begetting of families. So that unless the atrophic testicles become neuralgic the individuals are most unlikely to suffer any harm. Moreover, it is very infrequent for men over forty to complain of varicocele. Those who do are almost always under twenty-five, in whom the testicle will not have atrophied.

Signs and Symptoms.—On inspection, it is at once noticed that the testicle on the side affected hangs the lower. In some cases it hangs extremely low, there being quite a neck or constriction obvious in the scrotum above the testicle. The scrotum itself is generally relaxed, smooth and pendulous;

often it is also moist and, then also, odorous. Frequently the thickening of the varicocele can be seen, either in the upper part of the scrotum or as a mass round the testicle. If the thickness of the spermatic cords be compared at the upper part of the scrotum, that with the varicocele will be found increased. The varicocele has a slight impulse on coughing, but not the expansile impulse of a hernia. By lifting up the scrotum of a recumbent patient, the varicocele is emptied; it can be filled by making him stand up, and particularly if the finger is placed lightly on the external abdominal ring. To the feel, the distended veins have been likened to "a bag of worms." The diagnosis is easy; a hernia and an abdominal tumour, such as of the left kidney which could give rise to a symptomatic varicocele, must be excluded.

The testicle which accompanies a varicocele is usually smaller, softer and more tender than that of the other side. Normally, the long axis of the testicle is directly upwards, outwards and a little forwards. When accompanied by a varicocele, it will often be found to have become horizontal. The practitioner must take care of another point, **above** the testicle little or no varicocele can be felt; but **behind** it there may be a large clump of varicose veins. In performing the operation for varicocele, attention should be paid to these veins, because when left behind they are a not infrequent source of dissatisfaction to the patient. In most men the varicocele produces no local or general symptoms, passing away as years go. In others, particularly if bodily or intellectually not so strong or run down, a varicocele may produce both local and general symptoms. The symptoms are pain, aching and dragging in the scrotum, groin, abdomen or loin with a hypersensitive condition of the testicle. These pains are most marked during continence and after excess of sexual indulgence. But they are least so or removed entirely by regulated coitus. Constitutionally these men are easily tired and fatigued, tending to become addicted to sedentary occupations to the exclusion of active outdoor pursuits. In bad cases, and usually from the suggestions of ignorant friends, they become despondent and fear that their virility is becoming impaired and that impotence is awaiting them. Frequently these subjects have been addicted to masturbation or other methods of sexual excess, the practice of which secret habits have often rendered them shy, morbid and brooding. In fact, I cannot but think that the practice of this habit whilst the glands are still immature, as before puberty, has something to do with the imperfect maturation of the testicles and perhaps with the occurrence of varicocele in adult life. These are the very subjects which come complaining of symptoms in a varicocele. Often they are sexual neurasthenics.

Treatment consists of two kinds. First of all, only treat those who need it and leave the others alone; if desirable giving them the warning that the varicocele will do little or no harm, that they will get better as they get older, and that they will be wise not to listen to the advice of those who are ignorant of the subject. With those who definitely complain of symptoms, treatment must be directed in two ways: towards the relief of the local, and of the general complaints. Bearing in mind the intimate relationship between the appearance of the varicocele and the onset of puberty, benefit may be derived from advice against incontinence; at the same time, and in suitable cases, opening the subject of matrimony. If such advice is unlikely to be useful, and its chief use is in regulating the functions, it is as well to treat the case with a suspender, early rising, cold baths, regular healthy habits, exercise and a tonic. Various practitioners like different drugs, and the collected experience of others shows that no one is preferable to another. If a course of this treatment is unsuccessful, or the symptoms local to the varicocele far outweigh the general and more neurasthenic ones, it becomes justifiable to advise operation. But it must be remembered that only the minority of patients require operation. There is now only one operation for this complaint: that by means of the open method and an inguinal incision. It is a remarkable fact that though this operation is performed so often in our hospitals and in private practice, there has been no record of its results. In consequence, Mr. C. A. Nitch and I examined over 100 cases; our report being published in the *British Medical Journal* of January 26, 1906. The results for convenience are divided into immediate and remote, under which headings they will be considered.

A. IMMEDIATE RESULTS OF THE OPERATION FOR VARICOCELE

1. **Haemorrhage.**—It is important that it should be realized that this infrequent complication may occur in two places: the scrotum and the abdomen. In the former situation, it is due to a badly applied ligature, or to the method of tying the ligatures together in order to approximate the divided ends of the cord and raise the testicle. Its symptom is **pain**; with such a complaint after this operation the scrotum should always be examined. In the latter situation, the haemorrhage is from a retracted spermatic artery; at first it is extraperitoneal and limited; but when it has burst through that membrane, it becomes intraperitoneal and practically unlimited. In the operation, the first ligature applied to the upper stump will have been broken, the vessels will have to be picked up and tied again; but meanwhile the spermatic artery may have retracted. For further information

upon this subject the reader is referred to the section on wounds of the spermatic artery (pp. 191–193). Its symptoms are those of abdominal pain, followed by those of internal haemorrhage, faintness, increasingly rapid pulse, restlessness, sighing, subnormal temperature, etc.

2. **Orchitis** usually begins on the third to the sixth day after operation. It is ushered in by local pain and swelling, perhaps accompanied by abdominal pain and a rise of temperature. If the wound is clean, the inflammation will subside; if it is septic, the testicle, wholly or in part, will slough. It was noted to have occurred, and been unaccompanied by suppuration, in 5·6 per cent. of the cases.

3. **Oedema and thickening of the scrotal tissues,** enlargement of the testicle or a hydrocele can be found in nearly every case if examined carefully a week or so after the operation. They need not always be present, though a flaccid hydrocele can often be noticed. These results are produced directly by the venous obstruction from the operation, and will become less and less as an anastomotic venous circulation is formed. If it is formed very slowly, or is inadequate, these early swellings form the germ of some very important remote results.

4. **Suppuration** occurred in as many as 4 per cent., but this varied much in the hands of different operators.

B. REMOTE RESULTS

The Testis.—Of all the conditions found after the operation for varicocele none was so constant as changes in the consistence of the gland itself, which were due to the formation of fibrous tissue. In many instances this is easily demonstrated by the greater hardness of the testis as compared with its fellow. When present in lesser degree, it is recognized rather by loss of elasticity than by actual hardness, and is most readily detected by absence or impairment of the sensation of fluctuation yielded by the normal gland; as, for instance, that of the opposite side. Such fibrosis was sufficiently gross as to be recognized in 84 per cent. of the cases examined. This figure is too low, as in no less than eight cases the presence of a tense hydrocele prevented examination of the testis; and in more, a flaccid hydrocele rendered the observation very difficult to make. Therefore, without exaggeration, we may say that *fibrosis of the testis was present in 90 per cent. of the cases.* In order to ascertain, if possible, how much of this change was due to the varicocele and how much to the operation, a large number of patients was examined before operation. Fibrotic hardening of the testis was found fairly frequently when the varicocele was large and had been present for some years, as in men over thirty; but in boys and young men under twenty-three, who constituted fully nine-tenths of the number examined after operation, the change was comparatively rare. From this it may be argued that the changes which result from a varicocele of long duration are produced more rapidly and in greater degree by the ligature and removal of the veins, as is done in the operation performed for its relief.

The Epididymis.—The operative procedure of removing the spermatic artery and the pampiniform plexus produces an indirect effect upon the epididymis by increasing its blood supply, for the subsequent anastomotic circulation is carried on largely by the deferential veins. Further, postoperative thrombosis may easily be produced in these veins by some injury inflicted upon them, in which case fibrosis of the epididymis will be marked.

The estimation of these changes is a very difficult matter, but it can be definitely stated that when the operation has been followed by signs of gross venous obstruction, the epididymis is larger, harder and more easily felt.

Size of Testicle.—In conducting the inquiry into the subsequent size of the testicle it must be pointed out that the results are unchecked by knowledge of the gland prior to the operation. It is, however, a matter of general observation that the testicle usually associated with a varicocele is smaller and softer than that of the other side, yet examination after operation showed that 55 per cent. were distinctly, and often greatly, larger.

This increase of size, invariably associated with increased hardness and loss of elasticity, is probably due to a new formation of fibrous tissue such as is known to occur in connexion with chronic venous congestion or chronic inflammation elsewhere. What the subsequent spermatogenetic function or the procreative value of the enlarged testis is cannot be said; but it is highly probable that it is much diminished, if not lost altogether. In 21 per cent. of the cases the testicle was obviously smaller than that of the opposite side; but whether this lesser size was present before operation cannot be said. In 16 per cent. the glands were of about the same size. This equality may have arisen from an increase in the bulk of the rather smaller testis, which is known to be commonly associated with a varicocele, and considering the great frequency of obvious enlargement this explanation would seem to be likely. Both these classes will contain glands which have or have not undergone any change. Therefore, regarded from the point of view that the operation precipitates results which are similar to those which the varicocele itself produces in the course of years, the testicle is very unlikely to remain unaltered in size.

The Skin and Connective Tissue of the Scrotum.—The changes in the size of the testicle appear to be related directly to the degree of venous obstruction caused by the operation. Signs of this obstruction are not seen alone in the testicle as already described, but also in the skin and tissues between the tunica vaginalis and the scrotum, as well as in the tunica vaginalis itself, as will be pointed out. These changes occur in consequence of the operation, the congestion in the tissues lasting so long as the anastomotic circulation is inadequate. It is of particular interest that such thickening of the scrotum and connective tissue, or the formation of a hydrocele, are very rarely seen to complicate a varicocele. Their occurrence after the operation for its relief supports the suggestion : that, particularly if unwisely performed, *the operation precipitates and magnifies all the signs and symptoms of venous obstruction which a varicocele itself causes, and to obviate which we are supposed to operate.*

The tissues between the scrotum and the tunica vaginalis were noticeably thickened in 41 per cent. This figure is really too low, as the formation of a hydrocele obscures the observation. In 50 per cent. the scrotum was thicker on that side than on the other. Here again the percentage is too low, as hydroceles stretch the scrotum, making it appear thinner than it really is.

Hydrocele.—One other result of post operative venous congestion which will be considered is that of passive distension of the tunica vaginalis with fluid, a process comparable with the oedema of the scrotum and other tissues. This hydrocele makes its appearance very shortly after operation, and in some cases it is noticeable within the first week. It is an unpleasant complication for the patient, apart from its presence and weight. The hydroceles consequent upon varicocele operations are of two kinds: one, large and tense, which is noticed by the patient; the other, small and flaccid, which is not noticed by the patient. The former were present in 8 per cent. of the cases, the latter in 15 per cent., making a total of 23 per cent. Although 8 per cent. were aware of their condition, the majority of the 23 per cent., in spite of the hydrocele, pronounced themselves better for the operation. This flaccid hydrocele is undoubtedly due to a chronic inflammatory condition of the tunica vaginalis following the venous obstruction, like the variation in size of the testis. One patient only developed a hydrocele after his marriage, eighteen months from the date of his operation. In another, the hydrocele only appeared two and a half years after the operation. The man was only twenty-three years of age and could give no cause for the appearance of the swelling. As there was no disease of the testicle, the suggestion is, that in his case, as in the one just mentioned, some vasomotor disturbance upset the unstable physiological equilibrium between the secretion and absorption of fluid by the tunica vaginalis. Though as a general rule these hydroceles form early, and, in many cases, disappear entirely; yet it is obvious that a man is not free from this complication for a considerable period.

Spermatocele.—The occurrence of spermatoceles after this operation would seem to be correlated with the fibrotic changes in the epididymis. They were single and seemed to be associated with the venous congestion and fibrosis, though some local cause may have determined the precise site of their formation. Hitherto the possibility of their occurrence as a remote result of the operation for varicocele has not been appreciated.

Hernia.—An inguinal hernia was present in 2 per cent. It is most unlikely that these herniae were due to the operation; still, if a large varicocele is removed, a large loose inguinal canal is left behind, through which a hernial protrusion may take place easily. It would seem better to suture the inguinal canal when operating on large varicoceles.

Thickening of Vas, Sensation and General Results.—In 8 per cent. the vas deferens seemed to be thickened, and it is highly probable that this was much more often the case but escaped observation. With regard to subjective sensations, seventeen cases alone complained of any pain in the testicle and six complained of pain in the scar. In none could any cause for the pain be discovered. The sensation of the testis was unaltered in 84 per cent., definitely increased in 9 per cent., diminished in 5 per cent., and altogether lost in 2 per cent.

Twenty-six out of 100 reported themselves as neither better nor worse for the operation. At first sight this is disappointing, but it must be remembered that many who are operated upon at the desire of the "Services" have little or no varicocele, and are often ignorant of their condition until refused by the examining officer. It cannot be expected that even surgery can render happier those who suffer nothing! Only four definitely stated that they were worse for the operation, and the rest—70 per cent.—were definitely improved and well satisfied.

Summary of the Remote Efforts of the Operation for Varicocele

Testis harder	90 per cent.
Testicle enlarged	55 ,, ,,
Testicle same size as gland of other side	16 ,, ,,
Testicle smaller than gland of other side	21 ,, ,,
Thickening of the scrotum	50 ,, ,,
Thickening of the tissues between the scrotum and the tunica vaginalis	41 ,, ,,
Tense hydrocele	8 ,, ,,
Flaccid hydrocele	15 ,, ,,
Spermatocele	2 ,, ,,
Inguinal hernia	2 ,, ,,
Recurrence of varicocele	2 ,, ,,
Thickening of the vas deferens	8[1] ,, ,,

---

[1] Probably a good deal too small, as the anastomotic circulation is provided to a large extent through its vessels.

Sensibility of testis, unaltered .	84 per cent.
,, ,, ,, increased .	9 ,, ,,
,, ,, ,, decreased .	5 ,, ,,
,, ,, ,, lost . .	2 ,, ,,

From this it will be seen that operation for varicocele must only be recommended judiciously and not in every case of varicocele. But we know from the careful inquiry made by Mr. Nitch and myself, that if the patients complain of definite local symptoms in the varicocele, operation will improve or cure the great majority of them. But it cannot cure the neurasthenic symptoms. The best it can do is to affect these indirectly; for some neurasthenic patients can never hope to get well until the imaginary offender is removed. The operation is a small one; the patient may become cured of his neurasthenia: and it is most improbable that he will be made worse.

Finally, it was found that there was obvious recurrence of the varicocele after the operation in 2 per cent., without any obvious cause, such as a tumour of the left kidney. Mr. Nitch and I were more inclined to regard these rather as imperfect operations than as true recurrences; though true recurrences may be expected to occur, when young boys are operated on, unless the operation prevents the development of the physiological activity of the young testicle sufficiently to allow it to exist with the very deficient venous supply left it by the operation.

These results, with the critical remarks offered, show the foolish attitude of the Services towards candidates applying for admission. Colonel Howard, in an able letter to the *Lancet* in 1905 and in an article in *Treatment* 1906, has published a clear and authoritative exposition of his experience of this subject. Very much harm has been done by the enforcement of the unintelligent rule of having every varicocele operated on. Some poor men are even worse off on account of the operation, which often has to be done on varicoceles, the existence of which the men never knew until informed of it by the officer of the Service to which they sought admission.

SOLID TUMOURS OF THE SPERMATIC CORD

Lipomata are the only solid tumours of the spermatic cord which are at all frequent ; the next, and they are very infrequent, are sarcomata. Secondary tumours such as are due to the extension of malignant disease of the testicle up the cord are not meant. The tumours under consideration are primary tumours of the spermatic cord. The lipomata almost always originate in the subperitoneal fat, and are extruded through the inguinal canal which becomes dilated. They are usually followed by a process of the peritoneum, which in time may form a hernial sac. They form elongated painless swellings ; sometimes firm and at others soft, almost to fluctuation. They are usually irreducible and give a feeble impulse on coughing. Their growth, though slow, is more rapid than that of lipomata elsewhere. Clinically, they are indistinguishable from a piece of irreducible or semi-strangulated omentum. They are found in the spare as well as in stout, and at any age.

The treatment consists of the removal of the tumour and the examination of the inguinal canal for a hernia if it is suspected. It is particularly important that this should be done in the young. The lipomata are usually found during an operation for hernia, not having been suspected previously.

CYSTIC TUMOURS OF THE SPERMATIC CORD

Hydroceles of the cord constitute the most common of its cystic tumours. But as they are so well known and recognized, it is undesirable to disturb the present nomenclature; particularly so in a small book. But a very important paper has been published by Mr. Cuthbert Wallace,[1] in which he describes a tumour of the cord which may extend from the testicle, along the course of the spermatic artery, into the abdomen. It consisted of multiple cysts, which were separate from, and but loosely connected with, each other. In the scrotum, they form a more or less pear-shaped tumour, above and separate from the testicles, which is irreducible, has an irregular or nodular surface, little or no impulse on coughing and is translucent in parts. The scrotal tumour can be felt to enter the external abdominal ring; and by abdominal and rectal examination, it can be felt to be continuous with an abdominal swelling.

---

[1] *Transactions of the Clinical Society*, 1906, XXIX, pp. 157–163.

Mr. Wallace regards it as arising from some remnant of the Wollfian body. The diagnosis of irreducible, obstructed or strangulated omental hernia is generally made.

Both scrotal and abdominal tumours need not be present together, but a swelling consisting of multiple cysts may be present in either situation. Indeed, these cysts, which are primarily extraperitoneal, may become intraperitoneal and adherent to the appendix or other viscera as Mr. Wallace has described. It is very likely that this form of tumour is at the bottom of the historic cases which have been described as "diffuse hydroceles of the cord" by Percival Pott and Scarpa.

It is a curious thing that these swellings of embryonic origin need not make themselves apparent until middle life. For instance, some have not been noticed until the patient was forty years of age. When diagnosed, operative treatment alone is of any use and should be undertaken early before the cysts have invaded the peritoneum and become adherent to the viscera.

CHAPTER XI

THE VESICULAE SEMINALES

THE vesiculae on account of their deep position have not received anything like the attention from clinicians which they deserve. With regard to injuries, on account of their position they usually escape. Simple inflammatory changes in them often never attract attention. Septic inflammations infect the vesiculae from the urethra. It is unusual for them to be the subject of an abscess, but they are so occasionally. The most frequent clinical condition in which they make their presence manifest is chronic vesiculitis of a septic nature. It is almost always a sequel of gonorrhoea, urethritis or an old gleet. The patient has aching uneasy sensations in the perineum, particularly on straining or sitting down. In nervous subjects there may be difficulty in passing water. High up in the rectum, above the prostate, the enlarged and tender vesiculae can be felt. As the chronically inflamed vesiculae lose their power of completely expelling their contents, they become dilated, their contents may be expressed when the patient is at stool, and they are probably responsible for the gleety discharge when it is only found in the mornings, having collected and overflowed in the night. Discharges of urethral origin can almost always be obtained throughout the day. When none can be got by day, that found in the morning probably has its origin in the vesiculae. Hence the great importance of its examination.

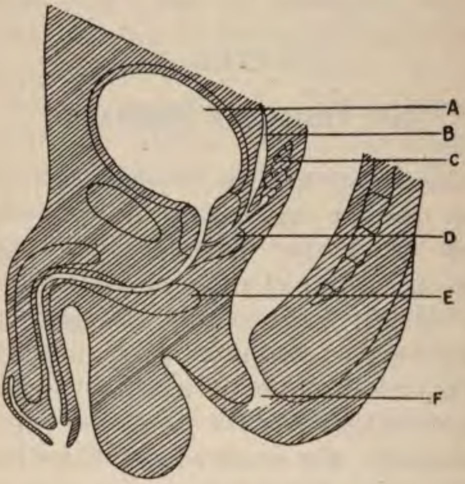


FIG. 30.—Diagram to illustrate the parts felt in a rectal examination.

A The bladder.
B The ampulla on the vas deferens.
C A vesicula seminalis.
D The prostate.
E The bulb. Cowper's glands are on either side of the middle line just above *E*.
F The anus.

With regard to treatment, these cases get well in the course of time. No local treatment except "prostatic" massage is of any use, and the general health must be the main consideration. First of all must come complete sexual rest, early rising, cold bath, breakfast, fresh air and exercise throughout the day, the diet must be full but not too generous, stimulants can be used at meals and not between, mental and bodily requirements should demand early retirement for the night. The bed and room should be gradually reduced to something like spartan simplicity, nothing being left to allow of sensuous and voluptuous ease. The patient's local condition will improve with his general health.

The persistence of an inflammatory process in the vesiculae so alters their natural secretion that spermatozoa can no longer be stored there and live. Hence the subjects of this affection may become sterile or infertile.

The persistence of troublesome symptoms, which get worse at times and in general incapacitate the patient, are almost the only justification for operation. The presence of the discharge and the patient's desire to get married may cause him to elect to undergo operation. It is not an easy thing to guarantee results, and it is a proceeding which should not be undertaken or advised without due thought. In itself, the operation of vesiculotomy is far from easy, unless the tube is distended with pus and forms a tumour. Vesiculectomy is never an easy operation, and often very difficult. The glands lie above the prostate, their upper ends diverging and being in close proximity with the rectovesical fold of peritoneum. The removal of these sacs absolutely sterilizes the individual. When they are thickened and enlarged there is no medical means of cleansing them, and micro-organisms can go on breeding eternally within them. Hence it is certainly justifiable to remove the vesiculae in inveterate cases.

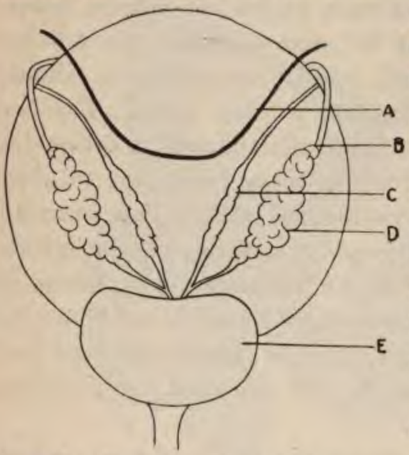


FIG. 31.—Posterior view of the structures at the base of the bladder.

A The line of the reflection of the peritoneum from the bladder.
B The ureter.
C The ampulla of the vas deferens.
D The vesiculae seminales.
E The prostate.

The selection of these cases is difficult, and a few hints as to the means to be employed will be useful.

1. The presence of localized tenderness or swelling along the urethra will indicate where the pus or discharge is coming from. A rectal examination must be made of the preprostatic urethra, the prostate and the vesiculae seminales.

2. Where the discharge can be expressed from,

First of all the patient micturates, attempts are then made to express discharge from the urethra, beginning near the meatus urinarius and gradually working backwards. If no pus can be expressed after micturition, the discharge comes either from an incompletely healed cavity in the prostate or from the vesiculae seminales.

3. Then pass sounds, up to large sizes. If very painful, the passage would suggest that the trouble is in the prostate. If the discharge is increased in amount, it confirms this suspicion. If the passage of sounds is not inordinately painful, and the discharge is not altered in character or increased in amount, it would indicate that the vesiculae seminales are diseased.

4. The absence of discharge during the day, its presence only being noted in the morning, is suggestive that the trouble is in the vesiculae.

5. A rectal examination may reveal the enlarged tender vesiculae.

6. The semen should be examined bacteriologically for the presence of organisms along with spermatozoa.

The true source of the discharge in cases of gleet, and even in less common cases of urethral discharge, is one of first-rate importance. The diagnosis, prognosis and treatment are necessaries to those who contemplate matrimony at some near or distant date. A bacteriological examination is of the greatest help in giving advice, and should always be done.

Tuberculous Disease of the vesiculae has been well known for a long time. It is very rarely a primary affection, though taking into account our ignorance of the diseases of the vesiculae in general, it may be said safely to be a great deal more common after chronic gleets than is supposed. In fact, many cases of apparent primary tuberculous disease in the epididymis or testis probably arise in this way. When recognized clinically it is almost always associated with disease of the testicle and is felt per rectum as a tender enlargement, often with hardening of the vesiculae. Its recognition is very important; for, whilst it is not an absolute contra-indication to operation on the diseased testicle, its presence must influence the prognosis. So far, no local treatment has been adopted, though an injection of some such medicament as iodoform emulsion could be done into an enlarged vesicule, from the perineum, the needle of the syringe being guided by a finger in the rectum.

In general, the operations of vesiculotomy and vesiculectomy are not called for, as the tuberculous disease has spread to the prostate and perhaps the bladder before they are diagnosed.

Syphilitic Disease of the vesiculae seminales is rarely recognized. In the secondary stage, particularly when the epididymes are affected, the vesiculae may be felt to be enlarged and tender, subacute vesiculitis. In the tertiary stage, they have been found to be fibrous and hard, possibly as the result of a diffuse gummatous infiltration. A definite gumma has never been described in this situation. The vesiculae have never been known to be affected in congenital syphilitic affections.

Primary New Growths are very rare in the vesiculae, which are known to be affected by secondary growths of the bladder, prostate and rectum.

Calculi occur in the vesiculae from time to time as the result of chronic vesiculitis and inspissation of the secretion.

Those who suffer from an enlarged prostate commonly have some secondary affection of the vesiculae. The adenomatous tumours which cause the enlargement of the prostate obstruct the expulsion of the sperm. The vesiculae become dilated, pouched and chronically inflamed, their contained fluid becoming at times inspissated to form vesicular calculi. The symptoms which might arise therefrom are dwarfed and obscured by those of the urinary obstruction.

CHAPTER XII

THE URETHRA

THE diseases of the prostate form the subject of a separate book in this series. It is, in consequence, unnecessary to mention them here. But it is necessary to emphasize the fact that the prostate is a sexual gland and has diseases which harmonize with those of the rest of the genital tract. From a sexual and pathological point of view, it is a very important region of the genital tract, being the meeting place of the urinary with the genital tracts. Its genital importance in the young and its urinary importance in the old, have made the subject of its diseases too large and important to be included in the brief survey undertaken in this book.

URETHRA

Urethritis or gonorrhoea is a disease which concerns the practitioner more than the pathologist. In consequence, its natural history has never received the attention it deserves. Urethritis is an infective disease, the most frequent agent in the production of which is the gonococcus. It commences in the meatal end of the urethra whence it spreads upwards. In the mildest examples there is merely dysuria and inflammation of the mucous membrane, whilst in every case of severe infection the mucous membrane becomes necrotic in patches, leaving ulcers which when they heal may cause a stricture. The ulcers are similar to those on the skin, from which a lesson can be learned. When on the surface, the discharge stops when the ulcer becomes healed; and it is maintained as long as the ulcer remains unhealed. Similarly the discharge from a urethral ulcer persists, the gleet stage, when it is prevented from healing. Hence the treatment of the gleet stage must be directed more against what "prevents the healing," rather than to changes in the injections which merely stimulate the granulations. In fact, the treatment of this stage is the only one which requires special care, skill and repeated examinations.

The urethra is a canal which subserves two main purposes, the passage of urine and the passage of sperm. With this dual function are associated both genital and urinary diseases. With the latter, we have at present no concern, except in so far as they affect the genital functions.

Inflammation of the urethra is a disease essentially associated with the sexual process. But by no means necessarily so. With regard to its origin, it is never "simple," in the sense of being unassociated with the presence of micro-organisms; any more than it is possible to have a simple inflammatory process in the mouth or intestine. It has evolved and has taken origin in the fluids secreted by inflamed, and perhaps uncleanly, mucous surfaces. In the popular mind, a discharge from the urethra is always associated with the presence of the gonococcus. In the majority of cases this is true; but bacteriological examinations have made clear to me cases of urethritis due to the pneumococcus, the influenza bacillus, the colon bacillus, the diphtheria bacillus staphylococci, etc. The inflammations of the joints, not infrequently associated with urethritis, have been found to be due also to these organisms. Gonorrhoea is the most common but not the only form of urethritis. As this work is intended as a supplement to the textbooks and not to replace them, it is useless to describe the signs and symptoms of so well known a disease. Neither is it worth while to refer to the ordinary methods of treatment. Every practitioner has his own, believes in them, and cures his cases by them. It is only desirable for me therefore to touch upon certain points which are without the domain of the ordinary man in practice.

Preventive Treatment.—When a patient has exposed himself to a possibility of the infection, it is a good plan for him to wash out his urethra carefully with some solution such as permanganate of potash or protargol, each containing two grains to the ounce. By mechanical flushing such a proceeding may do good; not nearly so much can be hoped from the chemical action. A gonorrhoeal infection is always a "mixed" infection; that is to say, the gonococcus is always associated with other organisms. It is known that these weak chemicals can inhibit the growth of these "other" organisms, whilst they only exert a very indirect action upon that of the gonococcus. Therefore pathologically we cannot hope for much from this so-called preventive treatment if the gonococcus is really present. The question is a complicated one; for instance, two persons may be known to have exposed themselves to the same infection, yet one may become ill and the other remain unaffected. It seems to require something more than the mere exposure to infection to determine the incidence of an attack of gonorrhoea. This being so makes it still more difficult to estimate the value of so-called preventive treatment. Perfect cleanliness should be part of the toilet after every exposure to possible infection. If "preventive treatment" is to be undertaken let it be in the form of urethral irrigation, not mere injection, with a weak antiseptic solution, such as has been suggested. The irrigation should be done as soon after the exposure as is conveniently possible, and can be repeated once or twice with advantage in the course of the next day.[1]

The Abortive Treatment.—This is a form of treatment much sought after by patients and will, in consequence, always have a number of "specialists" who practise it. In the first place, every discharge from the urethra, or urethrorrhoea, is not gonorrhoeal in the sense that it is due to the gonococcus. Secondly, it is very doubtful if the weak chemical solutions, which alone it is justifiable to introduce into the urethra, exert any effect whatever on the gonococcus, except the purely mechanical one of trying to wash it out. Thirdly, it is to be regarded as bad practice ; we do not apply strong chemicals to patches of acute septic inflammation of the skin, unless it is fuming nitric acid to destroy the organisms along with the tissues which contain them. Hence treatment should never be undertaken to cure the gonorrhoea at once. Irrigation with very weak antiseptics often seems to prevent the onset of the more acute symptoms. Strong solutions should never be used ; they are responsible for much prostatitis, vesiculitis and epididymitis. And in every case of urethral irrigation begun early in the disease, the solution must only wash out the anterior urethra and must be prevented from going further back by the patient sitting on the arm or angle of a chair.

---

[1] For details of the method of urethral irrigation, the reader is referred to "The Operations of General Practice," by Dr. Pinches and the Author.

The Late Gleet Stages.— Local applications to the unhealed spot through a urethroscope are of some value, but should be done seldom and then very carefully. The solution used for such a local application can be of twice or three times the strength as that used for urethral injection or irrigation. Such applications are of use, as they are elsewhere, to stimulate weak granulations. The reason why a gleet continues is not so much that the granulations are inefficient to complete the healing, as because "something" prevents them doing so. Even when carefully treated, the granulations become weak and oedematous. But when stimulated they cannot heal, as the "something" still prevents it. Hence, local applications to unhealed urethral patches are usually and must be failures. If used at all they must be employed in conjunction with some means of overcoming the "something" which prevents the completion of the healing process. The important points are: where is this "something"? and what is this "something"?

1. Where is the "something" which prevents the healing and keeps up the discharge? First, examine the discharge bacteriologically to ascertain its exact nature. I have frequently found such discharges quite unconcerned with the gonococcus. For instance, to my knowledge it was due to the

proteus vulgaris. The presence of spermatozoa on a coverslip with the organism would indicate or suggest that the discharge comes from the vesiculae, at least in part.

The urethra is then carefully inspected with a urethroscope. If the place is in the anterior urethra, it is easily seen. But as the prostate is approached it becomes more and more difficult to distinguish accurately. If after the urethroscope has been passed, the urethra is distended with air blown in with a syringe, the inspection of the deep urethra is much facilitated.

A lump or a tender spot along the urethra is an indication of the situation of the source of the gleety discharge. This can be ascertained by palpation, rectal examination or by passing a sound or bougie.

2. Having located the source of the discharge, it is next imperative to consider the various situations in which it is found. For practical purposes the source of a gleet can be regarded as threefold ; in the urethra, in the prostate or in the vesiculae seminales, or any combination of these factors. When it arises from the vesiculae, those sacs are in a state of chronic suppurative inflammation. When it arises from the prostate, it is from a prostatic abscess which has left an unhealed sinus. A prostatic sinus is unlike an ordinary sinus which remains unhealed because of a mass of dead materia

or tissue lying at the bottom of it. A sinus in the prostate cannot heal, because the surrounding fibrous tissue, the result of chronic inflammation, will not allow it to contract. When the discharge is from an unhealed place in the urethra, it persists because the surrounding fibrous tissue will not allow the granulating spot to contract and heal. Both urethral and prostatic gleets, for practical purposes, arise in a similar manner. The first line of treatment should consist in the passage of full-sized sounds, i.e. up to 26–30 Clutton. An anaesthetic is administered if necessary, as it usually is when proceeding to large sizes. By this means the circumjacent fibrous tissue is stretched and possibly split, so that the more superficial granulating surface can contract and heal. Unhealed patches in the urethra can be cured by this method, which may need to be repeated once or twice. When the discharge proceeds from the prostate, it is not so frequently cured by passing large sounds; because the surrounding fibrous tissue is not sufficiently stretched. Moreover, unhealed patches in the urethra are often flat or nearly flush with the surface, and as such are easily broken up by sounds; whilst in the prostate they are often deep or bottle-shaped, in which case they are insufficiently broken up by sounds to enable them to heal. These imperfectly healed cavities in the prostate may form a breeding ground for the gonococcus for years. I have obtained active virulent organisms from one five years after the injection.

Local applications can be used through the urethroscope, but as a rule are unnecessary and partake rather of the nature of meddlesome surgery.

If the unhealed place is in the **urethra,** the passage of full-sized sounds will stop the discharge for a day or so, when it will commence again before it is cured. If the unhealed place is in the **prostate** one is not so confident as to what will happen. In practice, the discharge is often increased, though sometimes it may be temporarily diminished, and is rarely stopped quickly. If the discharge should be unaffected by this procedure it probably comes from the **vesiculae,** chronic vesiculitis. The diagnosis is confirmed by the presence of enlarged and tender vesiculae felt per rectum. When the gleety discharge arises from this situation, there is little to be done to hasten the cure. Drugs only affect the general health, and so the gleet, indirectly. In time, the discharge becomes cured, in most instances, simply by attention to the general health. Few cases require operative treatment which at present consists of vesiculotomy, though it is not quite clear that vesiculotomy should suffice. It need not of necessity sterilize the individual as vesiculectomy must. The only local treatment, which is really useful, is massage per rectum.

URETHRAL DISCHARGE AND MATRIMONY

Opinions are very diverse as to the percentage of men who contract gonorrhoea before marriage. Some think many, some think few. Experience soon teaches the importance of the question. Some get married knowing of the existence of a discharge; probably they are knaves or fools. Others, having previously suffered from gonorrhoea, enter matrimony without the least suspicion of any risk. In such a manner the lives and happiness of some men and women are sacrificed by the lack of proper instruction from our profession.

It is a very easy thing for a urethritis to leave behind a prostatic or urethral sinus which need attract no attention. Yet it may prove a source of grave infection to any woman who is infected therefrom. The presence of the sinuses is most likely to be found in those who had the disease for a long time. But it may be safely laid down that it is impossible to say there is no danger unless full-sized sounds are passed and any subsequent discharge examined by a reliable bacteriologist. Theoretically, this should be repeated more than once. A further test should be made, as the passage of sounds merely affects the prostate and urethra. The contents of the vesiculae are examined in cover-slip preparations of seminal emissions. Until these two things have been done it is impossible to say that there is no danger for the wife in the matrimonial relation.

STRICTURE OF THE URETHRA

A stricture of the urethra may exercise a very deleterious affect on the genital functions if it is neglected, by maintaining an infective condition of the deep urethra; whence the infection will cause chronic prostatis, chronic vesiculitis, chronic inflammation of the vasa deferentia and of the epididymes. The lesions are bilateral, and, if severe enough, can bring about sterility or infertility, either by the formation and contraction of a nodule of scar tissue in the caudae epididymis or by the perverted nature of the secretion in the vesiculae which will tend to shorten the life of the spermatozoa stored there. Moreover the chronic catarrhal inflammation, which accompanies it, will have led to the shedding of the ciliated epithelium in the ducts, increasing the difficulty of transit of the spermatozoa from the testicle to the vesiculae. Hence it is of the utmost importance to the individual that the stricture should not be neglected but treated, and the urethra maintained clean.

CHAPTER XIII

PHIMOSIS

The word phimosis is given to a condition in which the prepuce or foreskin, either from its length or its tightness, cannot be retracted over the glans penis. It can be acquired as the result of the contraction of a cicatrix in the prepuce, as in the healing of a sore. When it is a congenital condition, it is always associated with a small glans penis and a small meatus urinarius. The disadvantages which it possesses are the retention of secretions, the difficulty or impossibility of maintaining cleanliness which will form a focus of irritation, the dangers of paraphimosis, the production of an eczematous state of the mucous membrane of the prepuce, the possibility of epithelioma, its influence on the occurrence of venereal diseases and their complications, etc., and in the congenital form, the imperfect growth of the glans penis. Formerly, it was taught that phimosis bore an important causal relationship to inguinal hernia, but good reason has been shown to doubt this.[1] And we must base our advice for the operation of circumcision on other grounds; for example, that of cleanliness. For choice, it is an operation which should be done in early babyhood, provided that the general condition admits. Then the operation is borne well, giving the minimum of discomfort, no anaesthetic is required and, usually, no stitches. Up to six months of age a healthy baby is very easily nursed, as it leads, more or less, the life of a vegetable, feeding and sleeping. On the other hand, there is no doubt that many cases of apparent phimosis in babies get quite well from the natural stretching of the prepuce by erections. In spite of this, I would strongly advise that this little operation is recommended at this age upon sanitary and moral grounds, all hypothetical arguments being avoided, so that the practitioner does not put himself in the position of a false prophet. In hernia cases a focus of irritation is certainly removed by the operation, a very desirable preliminary to further treatment which will be required. Much disappointment will be saved parents, if the true relationship between the phimosis and the hernia is pointed out. The little operation is one with which every medical man is familiar. It is therefore unnecessary to refer to all the steps taken. Whenever possible, it should be done as early in life as the child's condition admits. The prepuce is freed with a director, which must not be passed into the urethra. It is then drawn forward and either removed by a transverse snip with scissors or is at once split up the dorsum. Care must be taken to avoid injury to the glans, such as by passing one blade of the scissors into the urethra.

---

[1] *Lancet*, August 20, 1904: "The Pathology and Treatment of the Herniae of Children."

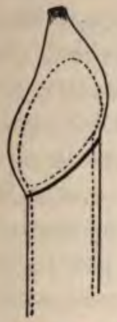


FIG. 32. — Skin Incision for Operation of Circumcision.

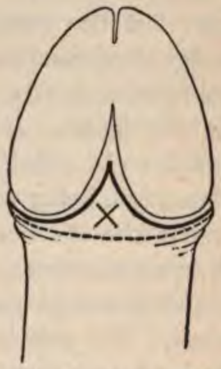


FIG. 33.—Incision in Mucous Membrane in the Operation of Circumcision.

Troublesome haemorrhage may occur from such a wound; or, sometimes, from the separation of adhesions between the glans and the prepuce. This can be controlled by pressure, styptics such as adrenalin, stitches, etc. The prepuce is removed by dividing the skin and mucous membrane close to the line of the corona. Bleeding vessels are ligatured. Care must be taken to remove the prepuce close to the froenum, otherwise the soft parts which remain will swell, forming an unsightly and inconvenient lump in this situation. This is a very common fault, and is apt to cause parents considerable distress. The mistake is usually made on account of dread of wounding the froenal artery, and is avoided by some men who make a point of always dividing this artery. It is not the division of the artery, but the removal of the soft parts which obviates the formation of the swelling. The mucous membrane and skin must be divided differently, as in the figure. It is sound practice if reliable catgut is to be obtained, to use it for ligatures and stitches; as, being absorbed, there is no need to take out the stitches, a difficult and painful task with swollen tissues. At this age no special dressing is required except some boracic powder and a pad of wool. The powder forms a crust which can be soaked off in a hot bath. The meatus urinarius should always be examined and if necessary stretched before the operation is finished.

In adults, it is better to employ general anaesthesia, as local anaesthesia is usually difficult and unsatisfactory. The operation can be done in the ordinary way, or, and I would recommend it, an incision with a sharp knife is made round the line of the corona glandis, the skin, connective tissue and vessels being divided down to the mucous membrane; the prepuce is then split along the dorsum and removed, after the mucous membrane has been divided. This method gives a very neat result. Catgut is the best suture material, because the removal of unabsorbable stitches is often very painful. The best dressing is a strip of lint, smeared with some boracic ointment, wrapped round and round the glans penis, and fastened with a safety pin. A pad of wool and a T-bandage completes the dressing. This can be soaked off in a warm bath whenever it is necessary to change it. Sometimes it is desirable to give rectal injections of bromide of potassium, chloral or a suppository of morphia to prevent erections. But as a general rule this is not required. The glans penis often remains extremely sensitive for four to six weeks, the patient going about with the body forward bent at the hips. When everything is soundly healed the epithelium covering the surface of the glans becomes thicker and less sensitive ; a condition that can be hastened by using *Eau de Cologne.*

If a man with a long prepuce contracts gonorrhoea, the discharges are retained in part and soon set up swelling and inflammation. The prepuce becomes so swollen and painful that the discharges collect and cannot be washed away. Under these circumstances, it may become necessary to operate. It is not advisable to do a complete circumcision, as the wound must granulate and the cicatrization sometimes produces more or less slight constriction of the penis. It is better and almost always sufficient to split the swollen prepuce up the dorsum, exposing the glans thoroughly. If this is not sufficient the prepuce may be split up the ventral surface in a similar way. The urethral discharge is got under by the usual treatment, and the local condition cleansed by means of sitting in warm baths. When this has been done sufficiently, the operation is resumed and the circumcision finished. Thus I would advise that in septic cases the operation be divided into two stages : the first, incision of the prepuce, should be called a dorsal or a ventral posthotomy according as it is on which aspect of the organ ; the second completes the circumcision, or posthectomy as it should be called.

In this connexion, it must be mentioned that the operation may be done for diagnostic purposes the two things most commonly looked for being a primary syphilitic sore or an epithelioma, less frequently a preputial calculus.

Patients not infrequently consult a medical man on the advisability of circumcision, when contemplating matrimony. If the foreskin cannot be retracted over the glans, it should certainly be done, not only on account of the dangers of phimosis but because sexual gratification will lead to increased activity on the part of the preputial and coronary glands, demanding a correspondingly increased care in maintaining cleanliness. Any chronically moist condition of the glans indicates the advisability of recommending the operation. A small poorly developed glans would be benefited by the same procedure.

In many cases the operation can be avoided by the careful induction of the habit of wearing the foreskin drawn back. But this must be begun by doing so for a short time once, twice, or more a day and gradually increasing the length of the times. The sensitiveness of the glans and the inner side of the prepuce can be allayed by the use of some spirit lotion. In a few weeks the oedema will get less and less, until at last a clean and healthy habit is acquired.

There is no doubt that either this habit or the operation of circumcision would do much to increase the comfort and cleanliness of the individual. From so much annoyance do they save the adult, that the operation should certainly be done on babies who have a long foreskin and the inculcation of the habit recommended to the older patients who have been neglected as babies.

Stretching the prepuce to relieve phimosis is a half-way measure and cannot be recommended except in special cases. It is much better to do the work properly, not leaving it half undone.

PARAPHIMOSIS

By paraphimosis is understood the strangulation of the end of the penis by a tight foreskin which has been retracted over it. The strangulation is always an acquired condition; though the tightness of the foreskin which causes it can be either congenital or acquired, the result of the cicatrization of some sore. Usually it is the latter. And in connexion with it is an anatomical fact. A long prepuce contains a preputial canal which has an external and an internal opening like the cervical canal of the uterus. It is the internal opening of the preputial canal which marks the junction of skin and mucous membrane and is the tighter. If this "os internum" is withdrawn over the glans penis it strangulates the latter. Thus the "os internum" is the obstructive band. As it is withdrawn over the glans before the os externum, it lies just behind the corona and is soon deeply sunk beneath the folds of the oedematous prepuce which have followed after it. The deep position of the strangulating band and the superficial position of the oedematous prepuce

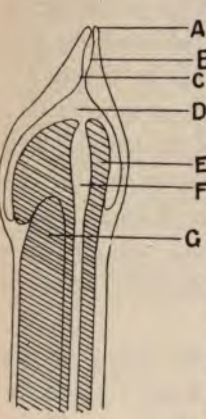


FIG. 34. — Saggital section of a Penis with Phimosis.

A The external os of the preputial canal.
B The preputial canal.
C The internal os of the preputial canal.
D The subpreputial or circumglandular space.
E The glans penis.
F The urethra.
G The corpora cavernosa.

are explained. As it takes only a very small degree of venous obstruction to make the loosely knit prepuce oedematous, the swelling gives an early warning of the condition. Reduction is as a rule easy in this stage. But if the warning is neglected the swelling of the prepuce is followed by that of the glans penis, the constricting band of the preputialos internum becoming more and more deeply buried by oedematous tissues. If allowed to progress it will ultimately lead to sloughing of the prepuce and to spontaneous relief of the strangulated glans. It must be much less frequent for the glans itself to slough, as it can get a blood supply from the corpus spongiosum.

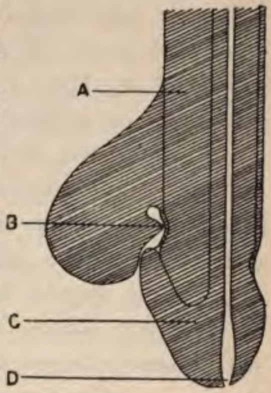


Fig. 35.—Diagram of the parts in Paraphimosis. The swelling is almost entirely on the dorsum of the penis, *A*. The constriction is produced by the internal os of the preputial canal, *B*, and has part of the subpreputial or circumglandular space behind it (above in the diagram).

C The glans penis.
D The urethra.

Paraphimosis in its later stages is a very painful condition and one which the sufferer will not declare until compelled to. It is one of the best and kindest things to do to give him an injection of five to ten minims of cocaine with a few drops of 1 in 1,000 solution of adrenalin under the skin of the dorsum of his penis, proximal to the strangulation, in such a way as to interrupt the physiological continuity of the dorsal nerves of the penis. It is better not to administer morphia until the paraphimosis has been reduced and the patient complains of pain. If the cocaine gives satisfactory anaesthesia, the reduction may be proceeded with; if not, a general anaesthetic should be given. Take the penis behind the constriction between the first two fingers of each hand, and, by exerting steady pressure on the glans with the thumbs, try and squeeze the glans through the constricting ring. This should be tried slowly and patiently. If it is not successful, make numerous punctures with a sharp narrow-bladed knife in the oedematous tissues; as the oedema subsides it will be possible to see the constricting band at the bottom beneath the folds of the prepuce. The folds are held well apart with the fingers of the left hand and the band freely divided with a knife. Care must be taken not to injure the subjacent corpora cavernosa; the band does not extend deeply but it is broad. If this is done at all, it must not be done half-heartedly but completely; with the fingers and thumbs, the prepuce is then drawn forward. The part is washed within and without with warm water, dried, dusted with boracic powder, and covered with a pad of wool which is retained in position by a T-bandage. It is well to look carefully to see that no constricting band has been left behind the corona; as if the band has been only partially divided, the paraphimosis may appear to be reduced whilst an undivided portion is left behind the glans. The swelling and tenderness will subside in a few days. Should there be any suppuration about the incision or sloughing of part of the prepuce, the patient should sit in a warm boracic bath for as long as possible night and morning. He can syringe out the inner side of the prepuce whilst in the bath.

When everything has healed and all swelling has subsided the question of circumcision should be placed before the patient. It is advisible that it should be done, if there has not been much sloughing, as the wound made when dividing the band will cicatrize, making the os internum of the preputial canal nearly as tight as it ever was. It has been suggested that in making incisions for the relief of a paraphimosis, two cuts should be made on either side of the froenum instead of dividing the tight dorsal band. In practice this is unsatisfactory, as it is not so much the actual tightness of the constriction as the fact that it is sufficient to obstruct the return in the dorsal veins of the penis. In consequence only oedematous folds are found by the froenum and no obvious constricting band to divide. It is relative not absolute strangulation which causes paraphimosis.

STENOSIS OF THE MEATUS

A small meatus urinarius is a congenital or an acquired condition. In the congenital form, it is always associated with a long prepuce and a small glans penis or some malformation like a hypospadias. In performing the operation of circumcision attention should always be paid to the meatus urinarius.

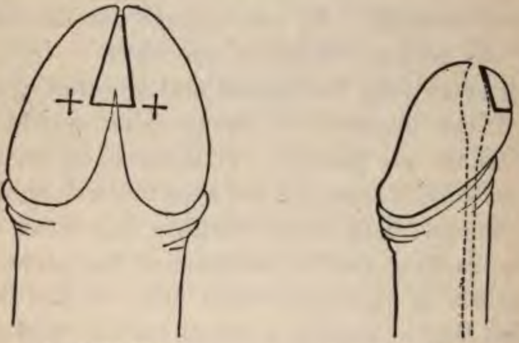
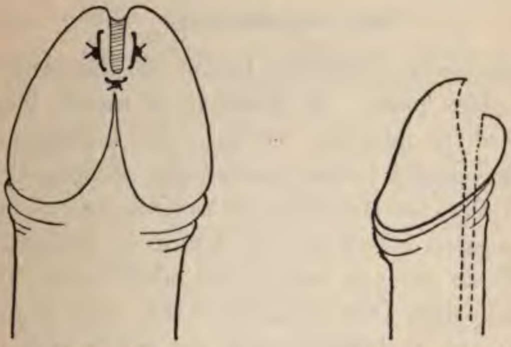

A. Front view. *B.* Side view.

FIG. 36.—Incisions for Meatorrhaphy.

After the operation, the opening increases in size *pari passu* with the increased growth of the glans. Beyond dilatation or stretching at the time of the operation, no further treatment is required. Acquired stenosis of the meatus occurs from cicatricial contraction, as from the healing of a sore. It is a troublesome condition because it tends to recur and recur after being treated. The ordinary method of treating it is to incise the stenosed meatus with a knife towards the froenum. Unfortunately, cicatrization always occurs, and the patient is often worse off after operation than before. Hence other means than simple incision must be adopted. A semilunar incision is made round the froenal side of the stenosed meatus and deepened for half an inch if possible, the mucous membrane and meatus being split on the froenal side. A triangular piece of tissue, with the base towards the froenum, is excised and the mucous membrane of the urethra sutured to the basal angles with mattress sutures of catgut to stop all haemorrhage. A soft rubber tube can be passed into the urethra from time to time for the patient to pass water through. This little operation is not easy to carry out in all details, but gives very satisfactory results. A sound should



A. Front view. *B.* In section.

FIG. 37.—Meatus after Meatorrhaphy.

be passed through the meatus from time to time, commencing as soon as the wound has healed. The base of the excised triangle alone contracts, leaving behind a normal sized meatus.

If further treatment is necessary, which it rarely is, it is advisable to enlarge the meatus by removing the part of the glans contiguous with it, preserving the mucous membrane.

BALANOPOSTHITIS

By the word balanitis is meant the inflammation of the glans penis ; by posthitis is meant inflammation of the prepuce ; as these two inflammatory processes usually, but not necessarily, accompany one another, then the condition is termed balanoposthitis. It is brought about by the action of irritants on the delicate mucous membranes which cover these parts, especially that on the inner side of the prepuce. The attacks of inflammation are much more frequent and troublesome to treat in those who have long foreskins or phimosis. On the other hand, the mucous membrane may become irritable in those who have no phimosis. Thus, the prime preventive measure is the operation of circumcision. Balanoposthitis is usually recognized as a complication of the irritant discharges of gonorrhoea or soft sores. In this acute condition it is well known and recognized. The chief warning, to be given to practitioners treating such a case, is that it is difficult to make sure exactly what are the pathological processes going on under the swollen oedematous prepuce; hard sores, soft sores, phagedoena or carcinoma may be hidden beneath it. So that if the inflammation does not subside quickly, it may be necessary to slit up the prepuce so as to be able to see what is under it. As this disease is well known in acute cases, it remains rather to direct attention in this manual to the more subacute and chronic conditions which are common but not well known. On account of irritation produced either by the retention of discharges within the foreskin, or as the result of coitus, the inner side of the prepuce becomes sore. Moreover it secretes more actively than usual on account of its hyperaemic inflammatory condition, maintaining the surfaces in a moist condition, such as lends itself to the multiplication of bacteria. Some cases show small patches where the epithelium has been denuded, leaving red bare patches. In more severe but chronic conditions the epithelium on the inner side of the prepuce and on the glans gets heaped up in places, forming white opaque patches rather like those described in chronic superficial glossitis, leucoplakia. Attention has been drawn to a corresponding condition of the female genital organs, but its occurrence in the male sex has been generally overlooked. Both with regard to the tongue and the vulva, the relationship between this superficial inflammatory condition and the incidence of epithelioma has been established. Epithelioma of the penis is almost invariably associated with a phimosis which prevents the detection of a leucoplakia. But the presence of an irritable condition of the glans penis and prepuce must be regarded as a serious condition in elderly people. The subacute or chronic superficial balanoposthitis of the elderly seems to be on a par with leucoplakia elsewhere ; the corresponding condition in the young is the result of the action of micro-organisms, and is infective. It is by no means necessarily venereal or gonorrhoeal. I have repeatedly seen cases when there is no suspicion of such an infection. Further, it is undoubtedly infective, as from husband to wife. In fact, one feels that gonorrhoea and its allied diseases arose in the beginning from the secretion of an inflamed mucous membrane. In these cases of subacute balanoposthitis perhaps the primitive disease is reproduced in a mild degree. Whilst in this irritable condition, the surface of the mucous membrane becomes coated with secretion, which dries, forming the flakes of smegma. This may become offensive if care is not given to cleanliness. Thus cleanliness and the use of some dry unirritating powder like the best starch powder form the keynote to the treatment. Cheap starch powder when it is moistened become acid. In this situation the powder must become moist, so that only the best should be used. Continence should be enforced. Emollient ointments or creams are soothing. When the irritation has subsided, the question of circumcision should be considered. The surface of the glans and mucous membrane of the prepuce can be treated with advantage with some spirit lotion or eau-de-Cologne. Care must be taken that the parts have lost their irritability before this is applied.

In some people who have been imperfectly circumcised or have learned to wear the prepuce drawn back, subacute posthitis can occur amongst the redundant folds of mucous membrane. The drying of the secretion to form the smegma gives an apparent dry glazed look to the part which is misleading. A special bacillus, the smegma bacillus, makes this region of the body its particular habitat ; and during such times of subacute inflammation and irritation with hypersecretion, they are very abundant. It is possible that the solidification and inspissation of the secretion are concerned with them ; likewise, also, the production of certain aromatic substances.

As a result of this chronic irritation, the mucous membranes concerned may become thickened and less sensitive. If habits of thorough cleanliness have not been contracted the amount of the smegma increases and becomes added to with epithelial débris and urinary salts until a hard substance is formed, **a preputial calculus.** These sometimes contain for a nucleus a small foreign body such as a bundle of hairs. They are found in middle aged elderly men who have some degree of phimosis and have neglected themselves. These calculi may become quickly encysted or, more often, they excite inflammation and ulceration in the contiguous tissues, producing a foul discharge from the prepuce, which is perhaps bloodstained. The picture is not unlike a case of epithelioma of the glans penis ; a hard tumour under an irreducible foreskin from which issues a foul sanguineous discharge. Removal of the prepuce will very likely be indicated for diagnostic purposes. Even if the calculus can be removed without doing this, circumcision should always be done, unless there is some special contraindication. Unfortunately, by the time that the calculus has made itself so unpleasant as to cause the patient to seek advice, all chance of removing it short of operation has often gone. But sometimes it forms an abscess on that side of the prepuce and sloughs its way through, the spontaneous cure commencing as soon as the calculus has been discharged. Occasionally a foreign body such as a short pencil is inserted under a tight prepuce and lost. Circumcision is the best treatment for the removal of all foreign bodies, or it should be done soon after the removal has been accomplished, when all discharge has ceased.

These foreign bodies are generally found in younger men than are the true calculi.

The subject of the acquisition of an infective balanoposthitis, such as that contracted between husband and wife, is well worthy of the consideration of the practitioner, as he may be able to do much to restore domestic confidence and harmony. In order to do this, the best way is to have cultures and coverslip preparations made of a secretion or discharge. In this way the presence of the influenza bacillus was discovered. In the case of a man-servant, I found a pneumococcus. There is no doubt that such non-gonorrhoeal organisms can be acquired through sexual connexion. But they need not be.

SEPTIC ULCERATIONS

By the words "soft sores" is understood a clinical picture of multiple ulcers which appear on the inner side of the prepuce within forty-eight hours of infection; they form much discharge, and though they may get well as rapidly as they came, they are frequently the heralds of inflammatory mischief in the prepuce, the glans, lymphatics, vessels and glands, veins, etc. These inflammatory processes may subside, but commonly go on to ulceration or suppuration. Occasionally a soft sore marks the site of the infection with other and more serious organisms, such as those of syphilis. It is well to give a guarded prognosis with these common cases, stating that they may be the heralds of further trouble. And it is well to have the *spirochaeta pallida* sought for. When uncomplicated, their treatment is easily summed up; cleanliness and dryness. The part should be well washed or, if the foreskin cannot be retracted, syringed with water or some dilute antiseptic. The part is then dried and powdered with starch powder, boracic, calomel or any mixture of such. There is no better treatment than getting the patient to sit in a warm bath night and morning, when he can syringe out the prepuce thoroughly. If kept thoroughly clean and dry, soft sores heal rapidly. Care must be taken not to discontinue treatment too early.

There is no organism which is specific in the causation of soft sores. Cultures yield growths of many organisms; in fact, from the constancy of the presence of pyogenic cocci, it can be inferred that they are responsible for the onset of the disease. Thus soft sores, often of a transient nature, can be found amongst moral as well as immoral people. They are evidence of an infection; almost always the result of sexual connexion; and though in far and away the majority of cases the disease is contracted from some prostitute, it need not be so necessarily. In such cases the septic sores are comparable to what has been said under balanoposthitis.

SYPHILIS

Syphilis is a disease which looms large in a book dealing with the diseases of the male generative organs. But this is not the place to cumber oneself with descriptions and details of the disease such as are to be found in the various excellent textbooks and monographs on the subject. I can merely deal with such characters of syphilis which I have found overlooked by practitioners and students.

The primary sore appears about three weeks after the date of the infection. On the penis, it is usually found on the mucous membrane of the prepuce close to the corona glandis. Here it soon develops the indurated collarlike roll and other features described as characteristics of the Hunterian chancre. But this is not the only form in which primary sores are to be found on the male genital organs. They are seen from time to time on the outside of the prepuce, on the side of the penis or on the scrotum; and in these situations they are superficial ulcerating surfaces of various shape and size, covered with granulations and perhaps with a scab. They are callous and show little tendency to heal; if picked up by the fingers they feel like a plaque, and may present a thin parchment-like induration. It is quite unlike the typical Hunterian chancre, and yet the same disease, syphilis, follows them both! What then constitutes the difference between these primary sores ?

It would seem that the induration and other stated characteristics of a primary sore, as seen on the inner side of the prepuce, are more characteristic of its situation than of the disease, as they are not seen in other places, such as on the skin of the scrotum or penis. Thus many signs described as typically Hunterian are merely present on account of the septic situation in which the sore is, and are not typical of the disease which Hunter did so much to recognize.

Now it is the typical Hunterian description by which it is taught that chancres should be recognized. Therefore, it is to be expected that mistakes in diagnosis will be made amongst such as do not present these features. It will be of little profit to spend time on the common chancre round the corona glandis, and it will be better to direct attention to other situations.

So long as the sore is within the sac of the preputial mucous membrane it is exposed to septic irritation and generally presents all the features of the typical chancre. As soon as it is beyond the mucous membrane, as on the skin at the orifice of the prepuce, it may lose these features. When on the skin, they are irregular shaped superficial sores, covered with a scab or with granulations which, if not septic, present a dry glazed appearance; there may be more than one present, they may present a parchment-like feel and vary in size from a threepenny to a five-shilling piece. Further, they are callous and give rise to little pain or discomfort; often they heal in part and break down again. Above them is a bubo of hard, small discrete glands. A superficial sore, particularly in a situation exposed to the risk of infection, such as a doctor's fingers, which will not heal, should always raise a suspicion of its specific origin. Although this tendency not to heal is a great characteristic of the atypical chancre, it must be remembered that they do heal without proper treatment, the patient developing other symptoms of the disease and being ignorant of ever having had a primary sore. Such can undoubtedly be the case, particularly in women. Sometimes a small superficial painless sore is associated with the presence of a pediculi. Every chronic inflammatory lesion can become indurated in time. Under these circumstances very great difficulty will be experienced in deciding on the nature of the sore, and anti-syphilitic treatment must be undertaken rather than allow the risk of the patient becoming an untreated syphilitic. In these days, a skilled bacteriologist should be called in to ascertain the presence or absence of the *spirochaeta pallida*. Its discovery has been very useful in deciding whether or not a sore is an extragenital chancre. This spirochaete has been found in primary, secondary and tertiary lesions; and also in several varieties, which may indicate pathologically what we already suspect clinically—namely, that there are varieties of syphilis.

TUBERCULOSIS

Tuberculous disease of the penis is very uncommon. Usually when found, it is in subjects in an advanced stage of chronic general tuberculosis. Generalized tuberculosis is a much more acute disease in the young than in the old. Hence it is in the old that tuberculous ulcers are found on the glans penis or prepuce. These are indolent sores which soon lose all typical appearance as tuberculous ulcers on account of being secondarily infected by sepsis. Should they become surrounded by a hard area of chronic septic inflammation they may be mistaken for chancres. On the other hand they may be mistaken for epitheliomata, particularly if the granulations are exuberant and the ulceration has eaten away part of the penis. But if the local appearance is likely to be misleading, the general is not: care must be taken not to take a narrow view of the subject.

Very rarely a tuberculous ulcer appears on the penis after connexion with a delicate "tuberculous" female, but such a condition is not unknown, though it would seem that they are septic rather than tuberculous sores.

After the Hebrew rite of circumcision, cases are known in which the wound has been infected by the tuberculous saliva of the officiating priest.

In general, treatment must be directed to the general rather than the local condition, which can be kept in abeyance with cleanliness, lotions and ointments.

MALIGNANT DISEASE OF THE PENIS

Malignant disease of the penis is usually carcinoma, only a few cases of sarcoma having been reported. It begins most frequently in the prepuce, then on the surface of the glans, and rarely in the urethra. There are two points on which all observers seem agreed; carcinomatous disease of the penis is intimately associated with phimosis which has been allowed to persist into the later decades of life; the irritation of the decomposing secretions, retained within, being the probable cause of the malignant growth. Of the three clinical types of carcinoma—the nodular, the ulcer and the fissure—the nodular is the most frequent and the easiest to diagnose. The ulcerous form is liable to be mistaken for a primary or tertiary syphilitic lesion. The fissure is associated with an icthyotic condition of the glans or inner surface of the prepuce, which might be called chronic superficial balanitis, posthitis, or balanoposthitis, as the corresponding condition of the tongue is called chronic superficial glossitis. Some years ago Mr. Butlin drew attention to a similar condition of leucoplakia or chronic superficial inflammation, which is found on the labia of women.

Before proceeding to the clinical recognition and treatment of the disease, the point of most interest in the pathology is its distribution by the lymphatics. When the prepuce alone is affected the infection spreads two ways—to the lymphatic glands in the groins and, to a lesser extent, by the dorsal lymphatics which accompany the dorsal vein of the penis to the pelvic glands. The former can be removed by surgical intervention, the latter cannot. Hence carcinoma of the penis is a very serious thing, the average duration of life being about six months to a year or eighteen months. When the cancer begins in the glans penis, it also spreads two ways : one, along the lymphatics of the corpus spongiosum and urethra to the perineum and pelvis ; and the other, along the lymphatics of the dorsal vein as already described. Thus when the growth commences on the glans or in the urethra, the infection may spread deeply, both far and wide, before any signs can be detected clinically. The corpora cavernosa are only invaded by direct extension, as their lymphatics do not appear to communicate with those of the corpus spongiosa. Thus, in plastic operations, the urethra may be freely separated from the corpora cavernosa without fear of inflicting injury on its blood or lymphatic supply.

The spread of the disease explains quite clearly why operations for cancer of the penis often have done so little to save the patients' lives.

Clinically, it must be remembered that carcinoma of the penis is very intimately associated with phimosis in men over middle age. The presence of a lump under the foreskin of an elderly man, or of a discharge issuing from it, offensive and perhaps bloody, should raise a suspicion which can be confirmed or not by slitting up the prepuce and examining the parts. No time should be lost in making the diagnosis and in resorting to operation, for we know that the time of life is short if treatment is at all delayed. The greatest difficulty is found in distinguishing a carcinoma from a venereal sore. A fortnight's observation and treatment should suffice to make the distinction. If there is no obvious result, a piece of tissue can be removed and examined, and the operation can be proceeded with straight away. The foreskin should be disinfected previously by syringing within with peroxide of hydrogen and by the patient using warm baths. These operation cases are apt to become horribly septic, so that time and trouble should be given to cleanse the part previously.

The operation of amputation of the penis can be done in two ways. The first, by amputating through the body of the organ, is quite sufficient in most cases. In the second, the scrotum is split and the penis removed entirely by separating the crura from the ischiopubic rami and stitching the urethra to the back part of the perineum. In either case, the lymphatic glands in the groins should be removed at a second operation when the amputation wound has healed. It is better to make two operations of the process, as the groin wounds are apt to get very septic if all is done at one operation. It is a vexed question as to whether to remove the testicles or not at the time of the amputation. There is no need to remove them when the amputation is done through the body of

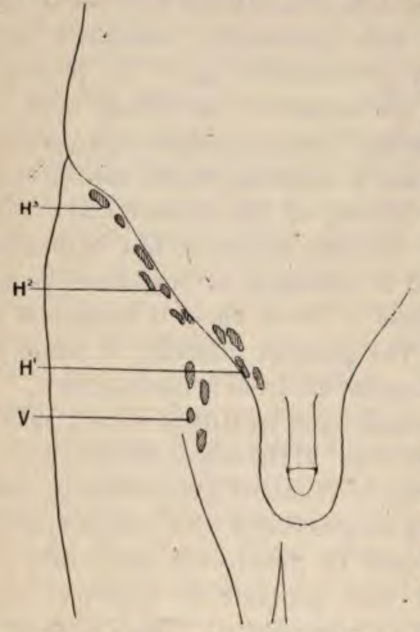


FIG. 38.—The groups of Lymphatic Glands in the Groin.

V Vertical set which drain the leg.
H So-called horizontal set which is divided into three groups.
H 1 The internal, which drain the mons veneris, genitalia and anterior part of perineum.
H 2 The middle, which drain the lower part of the abdomen.
H 3 The external, which drain the lower part of the back, the buttock, anal region and posterior part of the perineum

the penis. When the scrotum is split and the penis removed *in toto*, it is usually better that the testicles should be taken away when clearing the glands from the groins. Because it is particularly the inner set of the horizontal glands which require removal, and the removal of the spermatic cord facilitates this. The glands should be cleared away whether they are felt to be enlarged or not.

CHAPTER XIV

THE SCROTUM

Injuries.—The scrotum is uncommonly injured. It presents many likenesses to the scalp; the most important of which, from a surgical point of view, is that, when torn, the flaps carry their own blood supply with them. In consequence, gangrene of the flaps is rare and wounds of the scrotum heal well. In military life, a gunshot wound of the scrotum is very frequently accompanied by some wound of one or both testicles, when the import of the wound in the skin becomes lost in the injury to the gland or glands. In civil life when injured, the scrotum is almost always torn. These tears do not as a general rule involve the tunica vaginalis, the serous membrane being unopened. When the wound results from a fall on a spike, the tunica vaginalis is much more frequently opened, and the gland itself may be protruded through the wound, forming a true "hernia testis." The treatment of these wounds can be stated very generally. First of all an anaesthetic should be given; when a pad of gauze is placed over the wound and the pubic and other hair in the locality shaved, after which the skin is cleansed with an abundant supply of soap and water. The pad is then removed from the wound, which is washed out with a copious supply of sterilized saline solution. The skin edges are cleansed by rubbing with the saline and then with ether on a gauze sponge. The wound is carefully examined to ascertain the extent of the injury. All haemorrhage is carefully stopped; it being most important to avoid the formation of a postoperative haematoma. If the tunica vaginalis is unopened, suture the skin edges of the wound with "ten-day" catgut, and dress the whole with gauze fastened down with collodion. If the tunica vaginalis has been opened, the testis should be everted, examined and douched well with saline solution. It is then returned and the wound in the tunica vaginalis left open. The skin should be united with catgut sutures. The structures in the spermatic cord are not often injured. There is an uncommon accident which can follow scrotal injuries and is illustrated by the following case. A boy fell on a spike and lacerated his scrotum. Whilst the region was being cleansed under an anaesthetic, a hard lump was felt in the suprapubic region. It was cut down upon, and when exposed found to be pieces of the boy's trousers, drawers and shirt. The track was irrigated, when it was ascertained that the spike had passed upwards under the skin to the right side of the penis, driving up the clothes for a couple of inches above the pubes. The wounds were sewn up and, as generally happens in these cases, healed *per primam.*

Postoperative Complications.—After operation, there are three things for which to look. Firstly, *sepsis*; which is indicated by pain, elevation of temperature, local swelling and oedema, etc.; it should be combated by opening the skin wound, raising and supporting the scrotum, and using frequent reapplied hot dry dressings. Secondly, *haemorrhage*; which is indicated by pain, which is great and comes on shortly after operation. When pain is complained of an inspection of the part should never be omitted. This is the great advantage of the collodion dressing, as there is then no fear of infecting the wound. It can be treated, according to its degree, by an icebag or by operation. The third is generally of dual character, *orchitis and thrombosis* of the veins in the spermatic cord. The scrotum is raised and supported by an icebag. At first, the latter is usually more grateful to the patient than hot fomentations. If the testicle is fully developed, as in an adult, little harm will accrue, though atrophy may occur in a small percentage. If the gland is immature the orchitis and thrombosis will probably prevent it from developing any further.

Haematomata.—An extravasation of blood in the scrotum may occur in three places; between the skin and the tunica vaginalis, within the tunica vaginalis, within the testicle. The last two have already been discussed under haematoceles of the tunica vaginalis and injuries to the testicle. The first, scrotal haematoceles, can exist in two varieties. In one, the collection of blood is localized between the skin and serous membrane, and in the second it communicates with the cavity of the tunica vaginalis. They are always the result of an injury which is not infrequently the little operation of tapping a hydrocele, or that for varicocele. If small it can be treated with an icebag; whilst if large or increasing, it had better be incised under general anaesthesia, the clot evacuated and the bleeding vessel ligatured. When operating on the scrotum, additional care must be taken to sterilize the skin, as it is very difficult in this situation. For the same reason operation wounds should not be drained, as they are sure to become infected

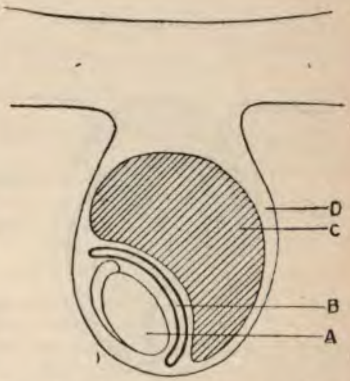


FIG. 39. A Scrotal Haematocele, *C*, between the tunica vaginalis, *B*, and the scrotum, *D*. *A* is the testicle.

if they are. They should be sutured and sealed.

Inflammation.—The scrotum is not often acutely inflamed. Subacute inflammation is not uncommonly seen in the erysipeloid condition found in children, whilst extravasation of urine forms the most frequent cause in adults. Besides these, may be mentioned pediculi, eczema, etc. If simple, the inflammation should be treated by raising and supporting the scrotum, and applying an icebag. When complicated by skin troubles baths, antiseptic lotions and ointments are to be used. If the inflammation is septic, the patient is anaesthetised and the scrotum incised along the median raphe. This incision suffices in general but is supplemented by an incision, on either side of the median line in front, which can be continued into the groin. No scrotal incisions should open the cavity of either tunica vaginalis. If sloughing of the scrotum occurs it is wonderful how

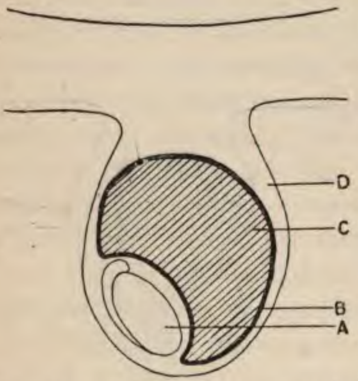


FIG. 40.—A Vaginal Haematocele, *C*, between the layers of the tunica vaginalis, *B*. *A* is the testicle and *D* is the scrotum.

quickly and completely the loss is repaired and the testicles covered in.

In loose tissue, like that of the scrotum, if any oedema occurs, it makes itself very obvious, as it does on the face. Thus in renal disease it may become much distended.

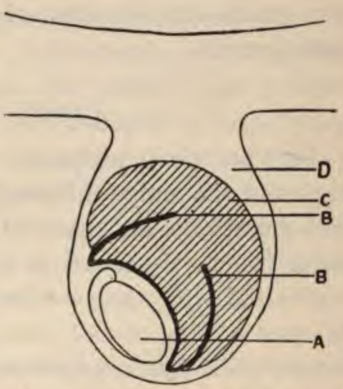


FIG. 41.—A Scroto-vaginal Haematocele, a combination of the haematoceles in Figs. 39 and 40, *C*. *B B* is the tunica vaginalis, through a hole in which the scrotal and vaginal haematoceles communicate. *A* is the testicle and *D* the scrotum. This form of haematocele most frequently results from an injury done in tapping a hydrocele of the tunica vaginalis.

Syphilitic Disease — Primary syphilitic disease of the scrotum is uncommon. In the secondary stage condylomata are not infrequently seen; whilst gummata uncommonly originate in the scrotum, which is invaded as a rule from the testis. In consequence, tertiary syphilitic disease of the scrotum is usually found on the *front and external part.* In congenital syphilis, condylomata are almost the only affection often seen.

Tuberculous Disease.—It is very rare for tuberculous disease to begin in the scrotum, which is almost always invaded from the epididymis. Thus tuberculous ulcers and sinuses are most often found at the *back, lower and outer part* of the scrotum, over the place in the epididymis most frequently affected by tuberculosis. In consequence, the treatment consists of that for tuberculous epididymitis.

CARCINOMA

For practical purposes, the scrotum may be regarded as only suffering from one variety of malignant disease, namely epithelioma. As it is most frequently found in sweeps, and seems to be connected with the soot and sweat of their toil, it is often spoken of as "sweep's cancer." It is very remarkable that sweeps should only be particularly liable to cancer in the scrotum and not to cancer in other situations. Further, it is remarkable why the part of the body least exposed to the soot, such as is the scrotum, should be selected as the site of growth by the cancer. Yet further, it is remarkable that it is English sweeps and not foreign sweeps who are prone to this affection. Thus there are a number of interesting aetiological features in the incidence of cancer of the scrotum, which would render their collection of interest.

It was in 1892 when Mr. Butlin published his paper on the subject. The disease commences as a wart or as several warts in the scrotum. They are often spoken of as "soot warts." If they remain warts they are harmless, but perhaps one begins to ulcerate, the ulcer spreading and invading the surrounding skin. Operation should be undertaken immediately one of these warts shows signs of increase in size or ulceration. Indeed, it is safer to remove the warts beforehand as suspicious growths. The glands in the groins soon become infected. Indeed they may become so large, while the scrotal growth is yet small, as to have given rise to the idea of primary "sweep's cancer" in the inguinal glands. It is now acknowledged that such cases in reality rest upon imperfect observation. The primary growth may be no larger than a split pea.

In this connexion it is well to bear in mind the three clinical forms under which an epithelioma may be seen. Firstly, it may tend to grow up from the surface and but little downward into the tissues, an **epitheliomatous tumour**. Secondly, it may ulcerate and remain more or less flush with the surface, an **epitheliomatous ulcer**. Thirdly, the growth may dip into and invade the subjacent tissues and not grow up from the surface, an **epitheliomatous fissure**. The three types present a gradation of malignancy, the last being the most easily overlooked and the most malignant. In consequence it is clinically the most important; and is the type of epithelioma present in cases of sweep's cancer with small primary growth and large secondary glands.

In the treatment of this affection, it is better to anticipate it and remove all scrotal warts, particularly in sweeps. If one of these warts shows signs of ulceration, operation should not be delayed. Except in the precancerous stages, the glands in the corresponding groin should be removed. It will be remembered that the glands in the groin are divisible in a horizontal and vertical set, the former being divided into inner, middle and outer groups. In clearing the groin for cases of carcinoma of the scrotum or penis particular attention must be paid to the inner group of the horizontal glands. A further point must be referred to. If the cancer invades the deeper structures, such as the tunica vaginalis, or the connective tissue about it, or the spermatic cord, it enters an area drained by the deep lymphatics which course along the veins of the pampiniform and deferential plexuses. Thus the lumbar or iliac glands may become infected, a misfortune which makes the patient's end a foregone conclusion. In the face of such a contingency, very easily accomplished, it must be yet again urged that the scrotum is a situation where operation is easily performed and should be undertaken whenever a reasonable suspicion of the existence of malignant disease can be offered. But at the same time, it must be understood that an operation which completely removes an ulcerating growth of the scrotum may be justified by the comparative comfort the patient derives, although the implication of the lumbar glands has taken away all hope of a cure.

In performing this operation it is unnecessary to remove the testicles or open the cavity of either the tunica vaginalis, unless it is implicated.

BENIGN TUMOURS

Benign tumours of the scrotum are uncommon with the exception of sebaceous cysts, which when present are usually multiple. Like sebaceous cysts elsewhere they may inflame, ulcerate, suppurate, cretify or even undergo malignant change. In the scrotum, they may also become pedunculated. When desirable they can be removed, either taking each with the skin round it or removing one large piece of skin with the tumours on it. Papillomata are the only other form of benign tumour at all common on the scrotum, and their import and treatment has been referred to when dealing with carcinoma of the scrotum.

INDEX

ABORTIVE treatment for urethritis, 224
Abuse, sexual, 164
Acquired imperfectly descended testicles, 93, 194
  infertility, 170
Adult testicle :
  relation to blood supply, 81–83
    to the vas deferens, 84–86
    to inflammation, 86–87
Aetiology of torsion of the testicle, 107–108
  of varicocele, 194
Abnormalities of descent of the testicle, 45–46
Anomalous descent of cord, 181
Artery, the spermatic, 191–193
Atrophy of testicle, 98–101

BALANITIS, 244
Balanoposthitis, 245–247
Benign tumours of the testis, 158–159
  of the scrotum, 269
Bilocular hydrocele, 24–27
  diagnosis, 27
  treatment, 27
Blood supply : relation to testicle, 80–83
  in child, 80–81
  in adult, 81–83

CALCULI of the vesiculae seminales, 219
  of the prepuce, 248
Carcinoma of the penis, 255
  of the scrotum, 266
  of the testicle, 154
Child's testicle :
  peculiarities of, 66–67
  relation to blood supply, 80–81
    to the vas deferens, 83–84
    to inflammation, 86
  tuberculous disease, 151–153
  in operations for hernia, 73
Chylous hydrocele, 27
Circumcision, 232
Clinical types of torsion of the testicle, other, 120–122
Congenital hydrocele, 17-19
  infertility, 169
Congestion of the testicle, 133
Cord, the spermatic, diseases of, 176–212
Cystic disease of testicle, 159
  tumours of the cord, 211
Cytological examination of hydrocele fluid, 32–34

DERMOID cysts of testicle, 160
Descent of testicle, 44

Development of testicle, 43
Diffuse gummatous infiltration of testis, 137
Discharge, urethral, relation to matrimony, 229

Encysted, haematocele of cord, 190
  hydrocele of cord, 186
Epididymis, changes in, after operation for varicocele, 203
Epididymitis, chronic, 129–131
Epididymo-orchitis:
  acute, 124–128
  pathology, 125
  results, 126
  signs and symptoms, 126–127
  treatment, 128
  chronic, 128–132
  syphilitic, 136
  tuberculous, 142–143
Excess, sexual, 164
External secretion of testicle, 47

Fixation of testicle, orchidopexy, 87–90
Functional affections, 161–175
Functions of the testicle, 47–49
Fungus testis, 135–136

Gangrene of the testicle, 120–122
Gleet stages, 225
Granulomata of testicle, 135–136
Growths, new:
  of penis, 255–259
  of scrotum, 266–269
Growths, new—*continued*
  of spermatic cord, 210–212
  of testicle, 154–159
  of tunica vaginalis, 41–42
  of vesiculae seminales, 219

Haemorrhage, after varicocele operation, 200
Haematocele:
  of spermatic cord, 189
  of hernia sac, 38
    acute, 39
    subacute, 40
    in cord, 189
  inguinal, 39
  scrotal, 39, 263
  of testicle, 102–105
  of tunica vaginalis, 34–39
    pathology, 36–37
    symptoms, 37
    diagnosis, 37–38
    treatment, 38–39
Haematoma of scrotum, 262
Hereditary syphilis, 140–141
Hernia after operation for varicocele, 207
  associated with congenital hydrocele, 18
    with infantile hydrocele, 20
    with inguinal hydrocele, 23
    with bilocular hydrocele, 25
    with imperfectly descended testicle, 65–66
    with movable testicle, 56–59
  operations for, in children, 73–74
  relation to masked descent of the testicle, 77–78

- Hernia, its relation to phimosis, 232
  - testis, 135–136
- Hydrocele:
  - after operation for varicocele, 205
  - of spermatic cord, 183–189
    - tubular, 183
      - treatment, 184
    - encysted, 186
      - treatment, 187
    - of hernia sac, 187–189
  - of hernia sac:
    - acute, 2
    - subacute, 2
      - diagnosis, 10
      - relation to congenital hydrocele, 18
    - of cord, 187–189
  - of testicle, 28–29
  - of tunica vaginalis, 1–42
    - acute, 1
    - subacute, 4
    - chronic, 4
    - pathology, 4–7
    - fibrous bodies in, 6
    - diagnosis, 10–11
    - prognosis at different ages, 11–12
    - treatment, 12–17
    - tapping, 12–14
    - results, 13
    - tapping and injecting, 14–15
    - results, 15
    - partial excision, 16–17
    - results, 16
    - incision and packing, 17
    - results, 17
    - extroversion, 17
    - congenital, 17–19
      - treatment, 19

Hydrocele—*continued*
    - infantile, 19–22
      - diagnosis, 21
      - treatment, 20–21
    - inguinal, 22–24
      - treatment, 24
    - bilocular, 24–27
      - diagnosis, 27
      - treatment, 27
    - chylous, 27–28
    - of testicle, 28–29
    - of hernia sac, 30–31
  - effect on the testicle, 31–32
  - cytological examination of fluid, 32–34
- Hypertrophy of testicle, 101–102

- IMMEDIATE results of the operation for varicocele, 200–201
- Imperfectly descended testicle, 62–79
  - physiology, 62–64
  - value of, 65
  - peculiar dangers, 66–67
  - the significance of pain in, 68–71
  - peculiarities in children, 71–73
  - masked, 77–78
  - relation to congenital herniae, 65–66
    - to malignant disease, 79
    - to blood supply, 80–83
    - to the vas deferens, 83–86
    - to inflammation, 86–87
  - operations for the relief of, 87–95
    - orchidopexy, 87–90
    - orchidectomy, 90–91
    - orchidocoelioplasty, 91–93

- Imperfectly Descended Testicle—*continued*
  - the acquired, 93–95, 94
  - summary of treatment for, 96–97
- Imperfectly developed testicle, 47
  - value of the, 49–50
- Impotence, 167
- Infertility, 168
  - congenital, 169
  - acquired, 170
- Inflammation of—
  - the epididymis, 129–131
  - the scrotum, 264
  - the spermatic veins, 193
  - the testicle (epididymo-orchitis), 124–132
  - the testicle in children, 86
  - the testis (orchitis), 131–132
  - the imperfectly descended testicle, 86–87
  - the urethra, 221
  - the vas deferens, 178
  - the vesiculae seminales, 213
- Injuries to—
  - the scrotum, 260–262
  - the spermatic artery, 191–193
  - the spermatic veins, 193–194
  - the testicle, 102–103
  - the vas deferens, 177
- Intellectual life, relation to sexual, 173–175
- Life, intellectual to sexual, 173–175
- Malignant disease of—
  - the penis, 255–258
  - the scrotum, 266–269
  - the testicle, 154–157
  - the vas deferens, 181
  - the vesiculae seminales, 219
- Masturbation, 164
- Masked imperfect descent of testicle, 77–78
- Matrimony relation to urethral discharge, 229
- Meatorraphy, 242–244
- Meatus urinarius, stenosis of, 242–244
- Mesorchium, torsion of, 111–112
- Movable testicle, the, 51–61
  - pathology, 57–59
  - results, 59–60
  - treatment, 61

- New growth:
  - of penis, 255–259
  - of scrotum, 266–269
  - of spermatic cord, 210–212
  - of testicle, 154–159
  - of tunica vaginalis, 41–42
  - of vas deferens, 181
  - of vesicula seminales, 219

- Occurrence of hydroceles at different ages, 11–12
- Orchitis, acute, 124–128
  - subacute, 131–132
- Operation:
  - for diseases of the penis, 255–259
    - of the testicle, 154–159
    - of the scrotum, 266–269
    - of the vesiculae, 219
  - for division of the vas deferens, 177
  - for herniae in children, 73–74
  - for hydroceles of cord, 184–187
    - of hernia sac, 189
    - of tunica vaginalis, 12–17
      - results, 12–17

Operation for hydroceles of the cord—*continued*
  congenital, 19
  infantile, 20–21
  inguinal, 24
  bilocular, 27
  chylous, 28
 for imperfectly descended testicle, 87–95
 for orchitis, 127
 of orchidectomy, 90, 122, 136–141, 149–153, 154–158, 159, 160, 38–39
Orchidocoelioplasty, 91–93
Orchidopexy, 87–90

Pain, the significance of, in imperfectly descended testicles, 68–71
Paraphimosis, 238–241
Pathology of—
 the movable testicle, 57–59
 the imperfectly descended testicle, 62–66
 the imperfectly developed testicle, 47
 torsion of the testicle, 109–112
 epididymo-orchitis, 125
 suppuration of the testicle, 133
 syphilitic disease of testicle, 137–138
 tuberculous disease of testicle, 142–146
 malignant tumours of the testicle, 155
 varicocele, 195
 malignant disease of penis, 255–256
 malignant disease of scrotum, 266–269
 gleet, 225
Pathology of haematocele, 36–37
 subacute hydrocele of the tunica vaginalis, 4–7
Peculiar dangers of the imperfectly descended testicle, 66–67
Peculiarities of the testicles of children, 71–73
Penis, diseases of, 231–259
Phimosis, 231–237
Physiology of the imperfectly descended testicle, 62–64
Phlebitis of the spermatic veins, 193–194
Postoperative complications in the scrotum, 262
Preputial calculi, 248–249
 canal, 238
Preventive treatment of urethritis, 222
Pyocele, 40–41

Recurrence, after operation for varicocele, 208
Relation of—
 intellectual to sexual life, 173–175
 the imperfectly descended testicle to hydroceles, 65–66
 the imperfectly descended testicle to malignant disease, 79
 the blood supply to the testicle, 80–83
 the vas deferens to the testicle, 83–86
 inflammation to the testicle, 87
 between urethral discharge and matrimony, 229

Relation of—*continued*
  phimosis to herniae, 232
  the imperfectly descended testicle to herniae, 74–76
  herniae to masked imperfect descent of the testicle, 77–78
  hydrocele in a hernia sac to a congenital hydrocele, 18
Results of the movable testicle, 59–60
  immediate results of operation for varicocele, 200–201
  remote results of operation for varicocele, 202–209
  tapping hydroceles of the tunica vaginalis, 13
  tapping and injecting hydroceles of the tunica vaginalis, 15
    radical cure for hydroceles, 16
  incision and packing hydroceles, 17
  extroversion of hydrocele sacs, 17
  epididymo-orchitis, 126

SARCOCELE, 136–141
Scrotum, the, 260–269
  injuries of, 260–262
  postoperative complications of, 262
  haematomata of, 263
  inflammation of, 264
  syphilis of, 265
  tuberculosis of, 265
  carcinoma of, 269
  benign tumours of, 269
Scrotum, the—*continued*
  haematocele of, 39
  skin, after operation for varicocele, 204
  connective tissues, after operation for varicocele, 204
Secretions of testicle, 47–49
Seminales, vesiculae, 213–219
Septic ulceration of penis, 249–250
Sexual abuse, 164
  excess, 164
  life, to intellectual, 173–175
Significance of pain in imperfectly descended testicles, 68–71
Skin after the operation for varicocele, 204
Solid tumours of cord, 210–211
Spermatic artery, 191–193
  cord, deliveries of, 176–212
    torsion of, 109–111
  veins, 193–209
Spermatocele, 207
Spermatorrhoea, 161
Stages, gleet, 225
Stenosis of meatus, 242–244
Sterility, 167
Stricture of urethra, 230
  of vas deferens, 178
Summary of treatment for movable testicle, 61
  of treatment for imperfectly descended testicle, 96–97
    for varicocele, 208–209
Suppuration in the testicle, 133–135
Symptoms of—
  haematocele of the tunica vaginalis, 37

Symptoms of—*continued*
  hydrocele of the tunica vaginalis, 8–9
  varicocele, 196
  sarcocele, 138–139
  tuberculous testicle, 147
  acute epididymo-orchitis, 126–127
  suppuration in the testicle, 134
Syphilis:
  of penis, 251–254
  of scrotum, 265
  of vesiculae seminales, 218
  of vas deferens, 180
  of testicle, 136–140
  epididymo-orchitis, 136
  tertiary disease of testicle, 137–138
  inherited, 140–141

TESTICLE, THE:
  its development, 43
  its descent, 44–45
  anomalies of descent, 45–46
  the imperfectly developed, 47
  the functions of, 47–49
  the value of the imperfect, 49–50
  the movable, 51–61
  the wandering, 51–61
  the imperfectly descended, 62–79
    its physiological value, 62–65
    its peculiar dangers, 66–67
    the significance of pain in, 68–71
    masked, 77–78
    and malignant disease, 79
    and herniae, 65–66

Testicle, the—*continued*
  operations for, 87–95
  the acquired, 93–95, 194
  summary of treatment for, 96–97
  and its blood supply, 80–83
    the vas deferens, 83–86
    inflammation, 87
  atrophy of, 98–101
  hypertrophy of, 101–102
  injuries to, 102–105
  inflammation of, acute, 124–128
  chronic, 128–132
  congestion of, 133
  suppuration in, 133–135
  hernia of, 135–136
  torsion of, 106–122
  syphilitic disease of, 136–141
  tuberculous disease of, 141–154
  in children, 151–153
  new growth of, 154–160
  in remote results of the operation for varicocele, 202–203
  hydrocele of, 28–29
  effects of hydrocele on, 31–32
Thrombosis of the spermatic veins, 193–194
Torsion of the testicle, 106–122
  the artiology, 107–108
  the spermatic cord, 109–111
  the mesorchium, 111–112
  acute, 111–115
  subacute torsion, 115–117
  haemorrhagic infarction, 118
  chronic, 119–120
  various types, 120–122
  treatment, 122

Treatment for—
  movable testicle, 61
  imperfectly descended testicle:
  non-operative, 96
  operative, 87–95
  summary, 96–97
  atrophy of the testicle, 98–101
  hypertrophy of the testicle, 101–102
  injuries of the testicle, 102–105
  torsion of the testicle, 122
  acute epididymo-orchitis, 127
  chronic epididymitis, 129–131
  chronic orchitis, 131–132
  suppuration in the testicle, 135
  hernia testis, 135–136
  sarcocele, 139–140
  tuberculous disease of testicle, 149–151
  malignant tumours of testicle, 157
  tubular hydrocele of cord, 184
  encysted hydrocele of cord, 187
  hydrocele in a hernia sac, 187
  varicocele, 200
  summary of, varicocele, 208–209
  disease of the vesiculae seminales, 213–219
  abortive, urethritis, 224
  preventive, urethritis, 222
  gleet, 225
  stricture, 230
Treatment for—*continued*
  phimosis, 232
  paraphimosis, 238–241
  stenosis of the meatus, 242–244
  balanoposthitis, 245–247
  preputial calculi, 248–249
  septic ulceration of penis, 249–250
  malignant disease of penis, 257–259
    scrotum, 266–269
  haematocele of the tunica vaginalis, 38–39
  hydrocele of the tunica vaginalis, 12–17
  congenital hydrocele, 19
  infantile hydrocele, 20–21
  inguinal hydrocele, 24
  bilocular hydrocele, 27
  chylous hydrocele, 28–29
Tuberculosis—
  a diverticulum of the bladder in a hernia, 19
  a hernia sac, 19
  the penis, 254–255
  the scrotum, 265
  the spermatic cord, 180
  the testicle, 141–154
  the tunica vaginalis, 4–7 32–34, 41–42, 147
  the vas deferens, 180
  the vasiculae seminales, 213
Tumours of—
  the testicle, 154–160
  the vas deferens, 181–187
  solid, the cord, 210–211
  cystic, the cord, 211–212
  the penis, 255–259
  the scrotum, 266–269
Tunica Vaginalis;
  diseases of, 41–42

Tunica Vaginalis—*continued*
  haematocele of, 34–39
  pyocele of, 40–41
  hydrocele of, 1–42
  with the movable testicle, 51–61

URETHRA, THE, 220–230
  stricture of, 230
Urethritis, 221
  preventive treatment of, 222
  abortive treatment of, 224
  the late stages of, gleet, 225
  relation to matrimony, 229

VALUE of an imperfect testicle, 49–50
Value of an imperfectly descended testicle, 65
Varicocele, 194–210
  aetiology, 194
  pathology, 195
  signs and symptoms, 196
  treatment, 200–209
Varicocele—*continued*
  immediate results of operation, 200–201
  remote results of operation, 202–208
  summary of results of operation, 208–209
Various types of torsion of the testicle, 120–122
Vas deferens, 176–182
  injuries, 177
  inflammation, 178
  tuberculosis, 180
  syphilis, 180
  malignant disease, 181
  anomalous descent, 181–182
Vasorrhaphy, 84–85
Vesiculae seminales, 213–219
  inflammation of, 213
  tuberculosis, 218
  syphilis, 218
  new growths, 219
  calculi, 219

WANDERING testicles, 51–61

C

LANE MEDICAL LIBRARY

This book should be returned on or before
the date last stamped below.

N45 Corner, E.M. 83876
C79 Diseases of the male
1907 generative organs.

NAME	DATE DUE